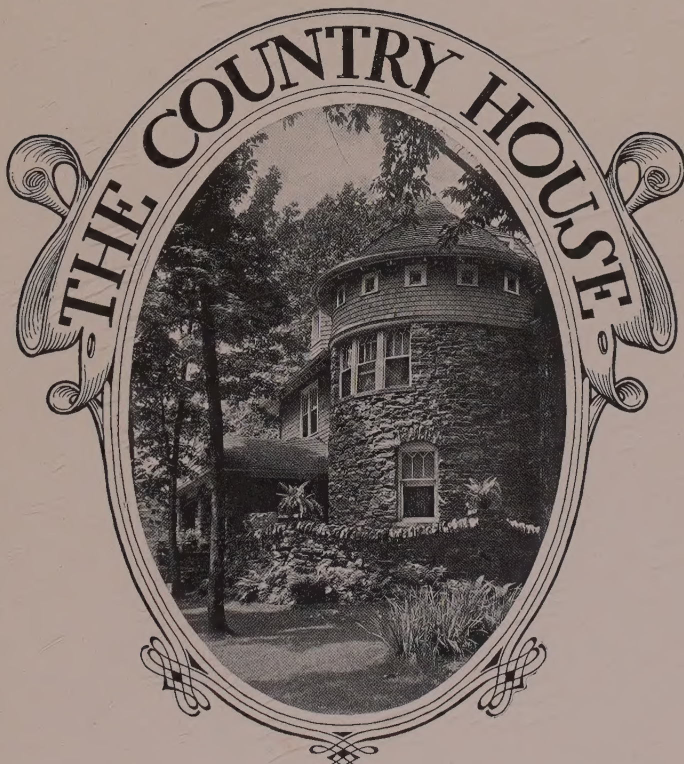
THE COUNTRY HOUSE

Residence of Mrs. Elizabeth O. T. McKay, at West Medford, Mass. Wm. Y. Peters, Architect.
A simple modern treatment of the Colonial, retaining some of the interesting crudeness of the parent style.

THE COUNTRY HOUSE

A Practical Manual of the Planning and Construction of the American Country Home and its Surroundings.

Written by CHAS. EDW. HOOPER

Illustrated by E. E. SODERHOLTZ
and others.

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Dedicated

To the home-building public,
with the hope that it will be of some
practical value to its readers.

PREFACE

IT is said that a man must needs build three houses before he will have one to suit him. It is the purpose of this work to forewarn him of some of the actual difficulties, that he may avoid the aforesaid expensive preliminaries, and to suggest such various points as are apt to escape his notice in the scheming and laying out of the country house.

In preparing this work the author is indebted to many men of professional standing who have kindly offered their help and suggestions, to the many owners who have allowed their houses to be photographed, and to the following works, which may well be consulted by the reader if he should desire to investigate the subject more deeply:

"Building Superintendence," by T. M. Clark; "Building Construction and Superintendence," by F. E. Kidder; "Construction Details," by F. W. Chandler; "Details of Building Construction," by Clarence A. Martin; "A Dictionary of Architecture and Building," by Russell Sturgis; "The Decoration of Houses," by Edith Wharton and Ogden Codman, Jr.; "American Sanitary Plumbing," by James J. Lawler; "Plumbing Simplified," by Wm. Paul Gerhard, C.E.; "Hot-Water Heating, Steam and Gas Fitting," by James J. Lawler; "Heating and Ventilation of Residences," by James R. Willett; "An Outline of Ventilation and Warming," by James Baldwin; "Principles of Ventilation and Heating," by John Shaw Billings; "Heating and Ventilating Buildings," by Prof. R. C. Carpenter; "The Disposal of Sewerage of Isolated Country Houses," by Wm. Paul Gerhard, C.E.; "House Drainage and Water Service," by James C. Bayles; "Water and Water Supply," by W. N. Corfield, M.D.; "Sinking and Boring Wells," by Ernest Spon; "Water Supply Engineering," by A. Prescott Folwell; "Modern Methods of Sewerage Disposal," by Geo. E. Waring, Jr., M. Inst. C.E.; "Munns' Practical Land Drainer"; "The Private Stable," by J. A. Garland; "Poultry and Pigeons," by Hugh Piper; "European and Japanese Gardens," published by Coates; *The Architectural Review; The Brochure Series of Architectural Illustrations; Country Life in America.*

The author is further indebted to Mr. E. E. Soderholtz for his collaboration in the procuring and selecting of photographic material, as well as for many valuable suggestions. His expertness in photography and understanding of architecture have served this volume well.

It is regretted that, in some instances, it has been so extremely difficult to discover the architects and owners of certain examples that the author has been obliged to omit the credit which would otherwise have been given.

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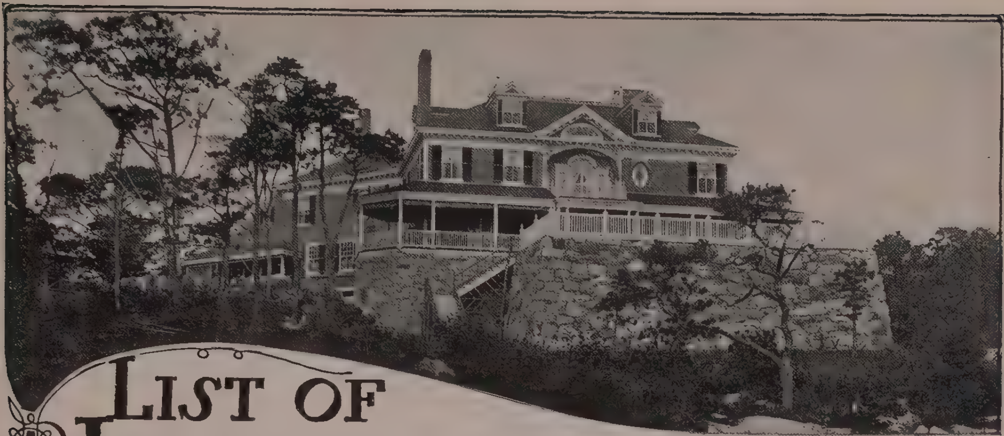


List of Illustrations

THE COUNTRY HOUSE

Entrance Gates to "Maxwell Court," Rockville, Conn. Charles A. Platt, Architect

THE COUNTRY HOUSE

CHAPTER I

Selection of the Site

ONCE the world was very young, and our prehistoric ancestry (if the Darwinian theory be accepted) roosted in trees, or swung therefrom by appendages long since eliminated and hence not found in the accepted Parisian fashion plates. Then there were neither doors nor windows, and the needs of the bath were not imperative. Gentle breezes blew as aimlessly as now; heavy foliage offered shelter from the sun; hair grew downward to keep out the weather, and the lee side of a tree trunk was better than a house.

Later came the cave man—he who invented the cellar. He had no tail, but just what he may have been is not definitely decided. Recent research seems to suggest that he must have been a good climber, despite the lack of caudal appendage, although he probably struck for his hole when he could, and built him a fire as protection against outside invasion. Little as we may know, it is evident, however, that he carefully chose the site of his cave in reference to the demands of his simple life, and if his ready-made home did not fulfil these he rejected it altogether. Thus we find him on elevations, near streams, and within reach of flint and the metals which he has so cleverly wrought.

A California avenue of palms, demanding the low-pitched roof and overhanging eaves to suggest the droop of the trees

Our problem is the same. We are limited by our needs, and must, like birds and animals, adapt natural conditions to them. With these the home may be temporary; with us it is permanent—that is, if we are fortunate in the exercise of our good judgment.

Generally one can tell the natural inclination of every individual, from the flat shuffle of the cityite to the momentous tread of the countryman, each of whose steps is a day's work. The migrating cityite is easy to mark; he never really forgets the flat step; but he, like the parrot, catches the half sense of things. There is he of the country inclination, with his hat on the back of his head, a straw in his mouth, stepping high, like a hen, from past experience with mud, sand and stones. The other variety is like a dog that has swallowed a mustard plaster—no matter which way he is headed for the time being, he will eventually bring up at water, though from reasons of an entirely different nature. Both hands are shoved deep into his pockets until he is round shouldered, and when he walks it is as if the lower part of his anatomy were in one piece. His nostrils are extended as if always smelling for wind, and when he looks at his watch he pulls his hat over his face and shades his eyes with his hand.

Be the destination of he who flees from the city what it may, the same general problem confronts him; the same general conditions are to be considered, and the same general requirements to be met. He still requires to eat, sleep and breathe fresh air, and the sunshine is just as requisite to his personal comfort, be he by shore or mountain.

This first problem, that of the site, is most important. The average man will build a fairly good house on a bit of land entirely unworthy of it. We cannot all draw plums, but let us at least have a decent slice of the pudding. It has been the usual method among prospective builders to determine upon the style and plan of the house to be built, and then to choose a site most unsuited for the purpose. This method of procedure is, strictly speaking, an illustration of the hackneyed "putting the cart before the horse," and yet it is frequently done with success. To have a *general* idea of what the plan may be is perhaps not overreaching the mark to any extent, and yet the "general idea"

should not be so firmly fixed as to cause future complications, as it is very apt to do.

As is often the case, one looks about for existing examples that please him; this is natural. If in the research he becomes completely and in-

The old Royal House, Medford, Mass. Showing a flat Colonial site with deciduous growth. The lower view gives the anatomy of the general lay-out

separably wedded to some particular style, then this style must govern the choice of the land and be ever uppermost in the question of its selection.

The better way, by far, is to determine on the site, procure it, and fit the house to the conditions it involves. This is the legitimate method of procedure, and will give better results in the end.

We all of us work, or have at least some connection with a business centre. This, first of all, should be a check in the matter of selection.

The average man is expected, except during his vacation, to be at a certain place each day for the transaction of business. His first care is that he shall not spend too much time on public conveyances in travelling back and forth. If he be located in a town or small city his problem is perhaps simpler than he of the large city; in either case, the nearness to public conveyances and a forethought for the future growth of the locality are all important. Although growth is natural, one does not care to be hemmed in with mushroom edifices before the first coat of paint has become hard.

If it be a case of a summer home simply, the problem differs again. More land is naturally implied, and, as a general thing, the conditions of summer and early fall alone are to be considered. Here again the question of ease of

access arises, and if one isolates himself it should be with the understanding of what it involves. If the man of the house is to come up every week, a compulsory drive of from thirty to forty miles each trip has its drawbacks, and eventually becomes tiresome.

Whether the case be that of the suburban or country home, the general condition of the public highways bears strongly on the question of ease of access. The one is to be considered for the entire year; the other offers the best there is in it.

It is always better to have lived in the chosen locality through the proposed months of occupancy, before building, in order that one may understand the conditions thoroughly and guard against unpleasant surprises.

One might as well be in the midst of wilds as to be located in a country where the source of supplies is poor. Of course one does not expect the country store to carry all the numerous little pet fancies of a capricious palate, but one does expect a certain amount of staple product, and occasionally a yeast cake that is not more than three days over the five-year limit. If one has chosen well, the finer needs of the table may be supplied from town. It is wise, however, to patronise the local man to some extent, if he is reasonable, in order that he may be encouraged to keep up his stock and that one may be sure at the same time that one will not go hungry. To rely entirely on outside supply is to tempt fate to the extent of an empty stomach and bad temper.

Fuel, too, is an item of some importance, and though prices are often quite reasonable in the country, yet, if it comes from a distance, the cartage, which may prove heavy, must be reckoned with.

Too much stress cannot be laid upon the question of privacy; it seems to be seldom considered by the masses at large. The good old continental practice of making a closed-in estate, a little world of one's own, is set at naught by the average builder. The absence of fences and tree screens throws what should be the owner's exclusive domain open to public invasion, and his neighbour's business becomes as important as his own. This is particularly true of the suburban "lot"—a poor little beast, bestraddled by a good, healthy house, whose tendency to reach out is nipped by circumstances which compel it to pull in both knees and elbows to escape its neighbours, like a fat alderman confined to space in a political parade.

Nearness to the highway is another menace to privacy, considering that the average American house faces the street. This is particularly obnoxious in a case where the lot is lower than the street and the casual passer-by can tell what sort of a rug you have on the floor. Naturally, if the house be planned after the English style, with the living room to the rear and facing the small private garden, then there is no objection to the structure setting closer to the street than is ordinarily in good taste; kitchen windows are high, and that part of the house generally takes care of itself.

The neighbourhood and neighbours—look to them well; both may change, even if of the best; this is your risk. As an extra precaution give yourself elbow room; it is convenient at times.

There are often public nuisances which, in some places, are hard to get

A bit of the Berkshire Hills of western Massachusetts. The house to be placed back of the pines might be a robust and vigorously detailed Colonial design. Whatever the style, it should be strong enough to serve as a foil to the towering trees

rid of. If your neighbour's pigpen is as good at fifty rods as it is at one—look out for it. If there is manufacturing within the radius of a mile, examine it carefully and note what it does. If there be a waterway handy, watch out for drainage; and the more especially if it passes through your proposed site. Your neighbour can, with either good or bad intentions, make things highly interesting for you. Marshes and swamps are often very obnoxious. Investigate—it may be worth while. As has been previously stated, it is best to live in the locality for a while and learn about it.

The principal thing to avoid, in the way of soil, is clay. It is best to have nothing to do with it, but if the conditions are so very extraordinary otherwise, and you are willing to drain both your wallet and the land thoroughly, as well as excavate and grade with gravel to the limit, it can be done. Soft, swampy land is also to be avoided, and the conditions of a rocky soil or ledge must be fully taken into consideration before any decision is made. Of course one must risk the striking of a ledge or rock in the digging of the cellar; it cannot always be foreseen.

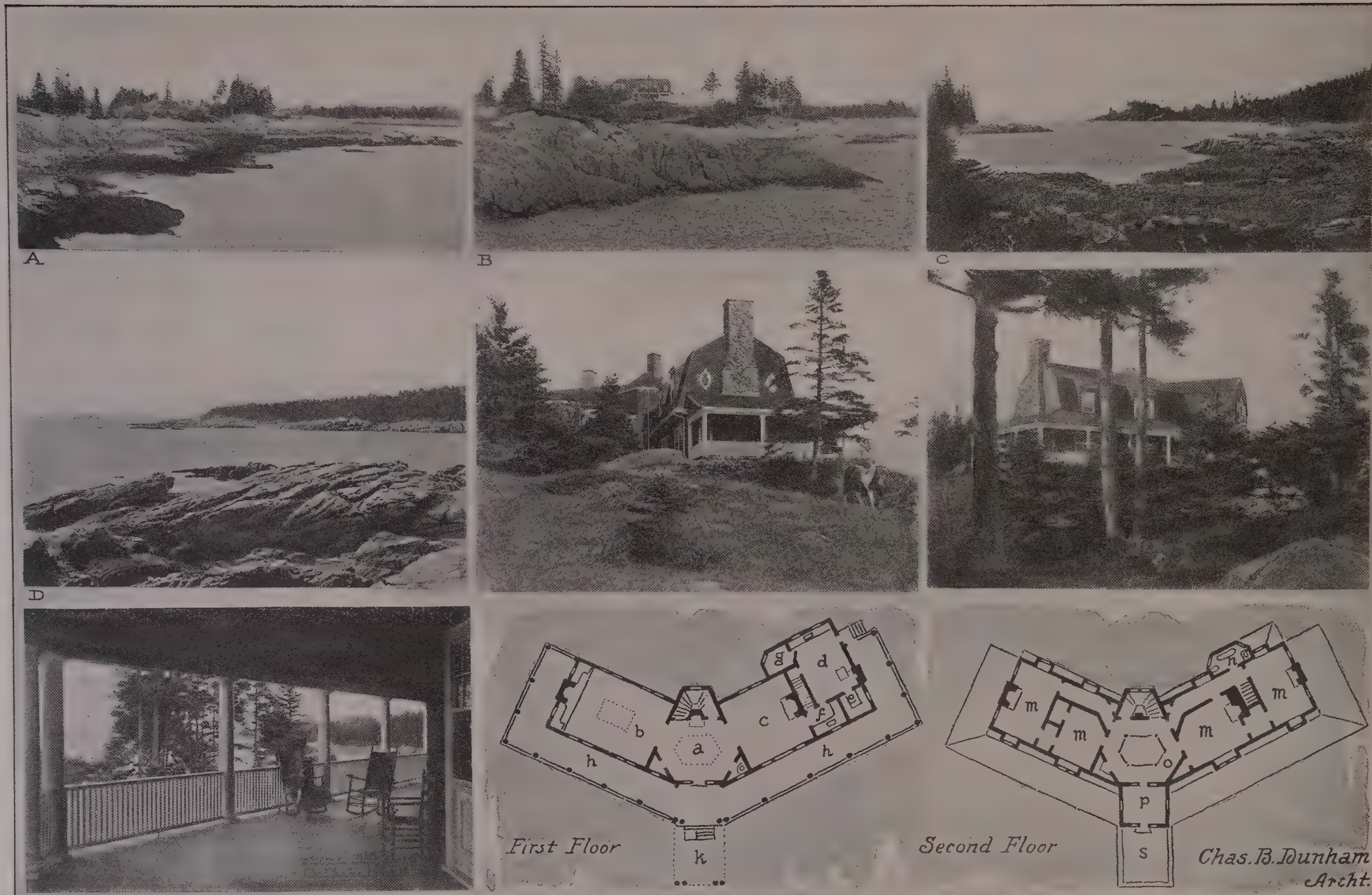
The best soil is, of course, gravel. The water filters through it easily and gives the owner some chance in the game. Sand filters too, but it will wash badly unless protected.

A house built on a rock partakes of the rigidity of its foundation. It is apt to vibrate slightly during a thunder storm, a fact which might annoy the timid individual to some extent at first. It is solid, however, and will not settle. The cellar under such conditions is a question. There is the ordinary summer house that may require no cellar. If the ledge slopes quickly, a cellar may be had on the lower side of it; but this should have a wooden floor, free from the ledge, to avoid such surface water as may flow over it. Blasting can be done, but this is too expensive for the ordinary house. A slight elevation is, of course, the best site for the house itself, be this natural or artificial.

The slope of the land, if it be marked in character, is better toward the south or in the direction of the best outlook. Things do not often happen exactly as we may wish—then begins the problem, which differs from others, and hence the advisability of planning the house for the land. The direction of the outlook is better toward the sun, that the living room may receive healthy sunlight at some time during the day.

It is advisable not to set a house too near the sea, unless it be at a considerable height above it. The storms of winter are often severe, and the place for the ocean is surely not in your living room, to say nothing of the damage to the outside of the house. From six to twenty inches of house wall is not much against a wall of water, with miles of wall on wall coming right along, with a soaring, snorting hurricane back of it, urging it on.

Once upon a time a cheerful idiot built a little camp on a two-by-four island in the most placid of inland lakes. His island was about four feet above summer level at the highest point, and his front porch set out over the water on posts. That winter the elements distributed kindlings to all the camps on the lake, and the porch was no more. The next winter did things to the camp itself, and the following summer the wreck was abandoned.



A summer cottage at Booth Bay, Me., showing the evolution from the bare site to the completed structure, with rough sketch plans

A. Site B. House on site (same view) C. View of house from river D. View seaward from site

a. Living room **b.** Billiard room **c.** Dining room **d.** Kitchen **e.** Pantry **f.** China closet **g.** Refrigerator **h.** Veranda **k.** Porte cochére **m.** Chamber **n.** Bathroom **o.** Hallway **p.** Nursery **s.** Balcony


The lodge at "Yaddo," Saratoga. A situation which suggests quiet and repose

These two problems of water supply and drainage are probably the most important of all considerations in the building of a house. With their nearness to perfection comes perfect health, and if they do not exist what excuse is there for a home anyway?

The water supply—a vital consideration—is either through public service or is a private affair. It will not take long to determine on the character and efficiency of the former. It should be pure and plentiful, and of sufficient pressure to guarantee its usefulness in time of fire. In this connection the effectiveness of the fire department should be considered, and rates of insurance often stand for much.

There is one advantage about the public service—if it should become polluted or otherwise impaired, the public will rise as a body to demand purification. If, however, its natural conditions are not good, it is little short of useless.

With the private service it is different, inasmuch as it may become a single-handed combat against natural odds or the power of corporations or moneyed individuals. Such conditions as these are expensive and exasperating, and should be well guarded against at the start.

When the public service does not exist, it is the question of the spring, or either the dug or driven well. The spring is a rarity (and by spring is meant that which is large enough to come to the surface in considerable volume—wells are oftentimes fed from small springs) and, of course, is to be treated as the dug well of greater or less size. The driven well is more expensive, but perhaps the best, while the dug well is the most common. If it be possible, samples of the water should be analysed before the purchase is made. Care should be taken that the well is not in a position to receive the drainage from any outside source—this is most important.

Where one can drain into a public sewer he is relieved of considerable worry and calculation on that score, although it is just as well to know where the sewer empties, and to be sure that by any miscalculation it does not connect with the water supply in some way.

In locating drainage on the estate where the private supply exists, it is

of great importance to see that the house and stable drain will not come too near or interfere with your drinking water, and that its final disposition shall be at a considerable distance from it and the house.

It is the natural possibilities of the site that should appeal to the prospective builder and be taken advantage of as far as possible. Elevation is a good thing, but if it necessitates much of a climb it should be avoided. Trees, too, are excellent, but their close proximity to the house should not be considered, as they shut in the view, hinder the circulation of air, help to decay the shingle roof, and fill the gutters with litter that eventually decays those of wood and clogs the conductors. Neither should they shut off the sun too completely—a certain amount of it is necessary. On the other hand, they may serve as a wind shield to cut off the house from the north or other points of the compass from which cold winds blow. Unless a hardwood growth is quite thick it will become useless for this purpose in winter, and even if close it becomes little more than a "strainer." Often the house can be shielded from the wind by setting it in the lee of rising ground.

It is not only in the winter that cold winds blow, but during the summer and fall one is likely to experience considerable discomfort from them. A thorough knowledge of the locality beforehand will tell one what to expect and guard against.

The outlook is, of course, one of the things which one naturally does not forget to consider; but it is not necessary to cut out every tree which comes anywhere near it. Vistas can be cut, or, as in the case of the sweeping view, the trees can be thinned out and trimmed so as to make it count for more and become more interesting than the frankly open sweep.

Consider your building from the point of view of material at hand. Wood is always safe, but in a rocky country the rough stone, with proper surroundings, is excellent. Generally speaking, stone harmonises best with soft wood growth, while brick seems to be best adapted to the deciduous tree. Wood can be handled to go with either. The cedar, being more formal, can be used in combination with any material. Plaster (or rough-cast) is, according to its treatment, possible anywhere. The above generalities are not laid down as infallible rules, but, broadly speaking, they apply. It is readily seen that the utilisation of the handy material has another advantage—that of cheapness. This little item is not to be sneezed at, considering the present rates of labour and material.

An estate on the Hudson River. The long undulating lines of the land add much to the character and possibilities of the place

It is well to have a fairly accurate outline of what you intend to do in the way of the placing of the buildings before you have definitely decided on the land. The house, stable, sheds, barns, poultry houses and yard, cow yard, kitchen garden, kitchen yard, well house and whatever else you may intend to embody should be roughly mapped, with due regard to the suggestions previously made.

After the purchase has been made, a plan should be drawn as accurately as possible, either by an engineer or by the owner. This should give the height from the street grade; the trees and their condition, character and kind; soil and location of ledge (if any). To help this plan in its intelligibility it is well to make a series of photographs of the place from various established points on the plan, as well as views from the road. When this is done, owner, architect and landscape gardener have something to work from, although the site will probably be visited by the latter. In making the pictures of the proposed site of various buildings, it is well that some person of known height be included in the view, standing on the site in question. This gives the scale at a glance, and is of much value to the architect, who may not visit the land until after the sketches are made.

If the question of price be an item with you, know this—that if you wear store clothes, a collar, and keep your shoes in passable condition, the average countryman will take you to be made of money and tack on the price accordingly. When a man hails from the city his fate is settled. No one with any sense of decency will object to paying a fair price for an article. On the other hand, one does not care to be taken in on the strength of an imaginary fortune.

The better way is to get a trustworthy resident to make the bargain in his own name and for you not to be known in the transaction. Be sure, however, that this is done with the knowledge and under the direction of a lawyer, otherwise your "trusty resident" may own the land instead of yourself, and offer to sell it to you afterward at more profit than he is entitled to.

Looking across Newfound Lake, N. H. A good location, ample height and excellent view, suggesting the Colonial farmhouse

It is always best to put a binder on the land as soon as you decide that you want it, or think that you want it, pending the looking up of the title. If you do not do this someone else may get in ahead of you. The best way is to bond the property for the sum agreed upon, paying a small sum to hold it for a stipulated length of time. This gives you the refusal of it for that time and for that price, and if you decide that it is not what you wish

The Orchard House, Concord, Mass. This suggests the possibilities of the old site

you lose only the binder. In this way several sites may be considered and the best selected. Be sure, however, that you have a lawyer's advice in your transaction, unless you know absolutely what you are doing yourself.

One argument in favour of the lawyer is that the laws of the various states often differ, and things which seem to be all right are not. For instance, if you buy a piece of land on the Maine coast, and in your deed your land is described as running in such and such directions, for such and such a distance to the *shore*, and hence *by the shore*, etc., you naturally suppose that you have a shore privilege. The fact is that you have no *legal* right whatever. On this point the law holds. Your deed should read "*to tidewaters* of so-and-so," and "*by tidewaters* so-and-so." Hence, get a lawyer; he is worth his hire.

In the matter of the title your lawyer again comes to the front; he is familiar with such work. If you know as much about it as he does, look it up yourself, but under no circumstances slight it—a clear title is important. If you do not make sure that the man who sells you the land has an undisputed right to it, someone may come along at any time and convince a court that his right is better than yours and—you lose. It isn't worth the risk. One rests easier with both the copy of a clear title and the deed, properly recorded, stowed away in one's inside pocket.

Not infrequently the old site offers as tempting a haven or one even more so than the new site. Its possibilities are well developed and the problem of rejuvenating becomes unique. In some instances the old trees are most tempting, although if these are not perfectly sound it is better not to consider them for a moment. Younger trees with a life before them are preferable to old ones whose life is near spent.

The various styles of houses are adapted to certain sites. Of course there are exceptions to the following, as there are to every rule. The careful designer often carries to a successful completion that scheme which at first seems impractical.

It must be confessed, however, that these instances are, in comparison with the number of failures, rather a small percentage of such attempts.

Generally speaking, the formal Colonial and English styles harmonise best with the comparatively level site and the drooping fluffiness of deciduous trees (see "Royal House" and "Estate on the Hudson").

A site in Roxbury, Mass. This demands a rough stone design of considerable force and strength

Rough, rugged sites like the view in "Roxbury" demand an irregular design of considerable force and strength—the rough stone wall would do very well. Rough stone is out of place, however, if used in a locality foreign to it, or where there are no rocks on the surface to carry out their character.

The long sweep, as in a "California Vineyard" calls for long, sweeping lines in the house. The "Berkshire Hills," as seen in the distance, might suggest several things; a house back of the pines might be a robust and vigorous detailed "Colonial." The "Maine Coast" might be shingle, log, or rough stone and plain plaster. The "Newfound Lake" and the "Penobscot River" suggest strongly the rambling irregularity of the Colonial farmhouse. The "Avenue of Palms" calls loudly for a low-pitched roof with over-hanging eaves which shall suggest the droop of the trees. The various styles of tropical houses might give new and excellent ideas—it is an interesting problem.

It has been already suggested that the "Estate on the Hudson" could be embellished with a formal Colonial design. It will be noted, however, that the existing building is well set in its place and seems a part of the grounds. This is in a measure due to the fact of its regularity and lack of aggressiveness. In design its central motive is derived from the French farmhouse, while the wings are embellished with dormers

A California vineyard. Level stretches of country call for the low structure, with long, sweeping lines

having the low pitch of the English half-timber period. In speaking of the English half timber, it is well to add that a design in this style would not look out of place on this site.

One very good method in determining the design that suits the site is to collect photographs of foreign examples, which can be gotten in the larger cities; domestic examples should first be well studied to understand their adaptability. Of course, it is not reasonable to suppose that these can be taken literally; conditions of living are different. They will, however, offer invaluable suggestions for adaptation. Besides photographs, there are some high-class architectural publications which reproduce these, and which can be seen at many of the libraries.

Not only should the acknowledged styles of the Continent be considered, but also the less known art of nations in other parts of the world.

On the Penobscot River, Me. A chance for long, low, rambling Colonial lines

It is quite noticeable that parts of rough and pine-clad Maine bear a striking resemblance to some parts of Japan. It would be impossible to imagine the bamboo in this connection, and yet a modification of the simple Japanese house is not so foolish as it seems at first. Some of the pine growth in this state reminds one most forcibly of the charming specimens in Japan; and as to stone—Maine can surely hold her own.

Now, for the sake of direct argument, let us take a practical example (see cut). This site is on the Hudson River. It does not matter where. If you find it (and it is safe to say you will not), lay hands on it at once—it is a gem.

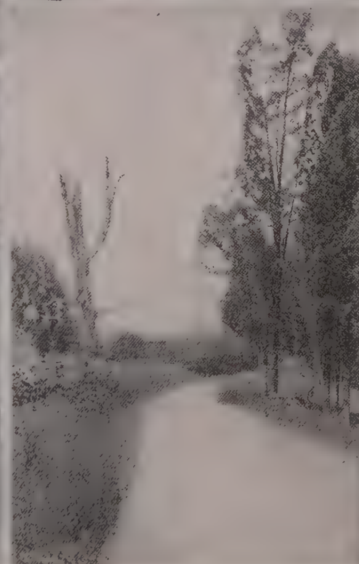
Well above the river runs a highway, broad and ample. Northeasterly, about three-quarters of a mile, runs another highway, equally ample and generally parallel to the first. Connecting these two is an old road more or less irregular in its direction, and, being semi-public, is cut off by gates at either end (see "G"). A short distance up on the old road from the river road the path divides, the right-hand branch swinging off to reach a clear, cool spring, which comes from the rocks (see "A"). This road swings round to intercept the main branch again at a point at which it makes a right-angle turn to the northwest. The road by the spring is about twenty-five feet above the land below, a rough

A

B

C

D

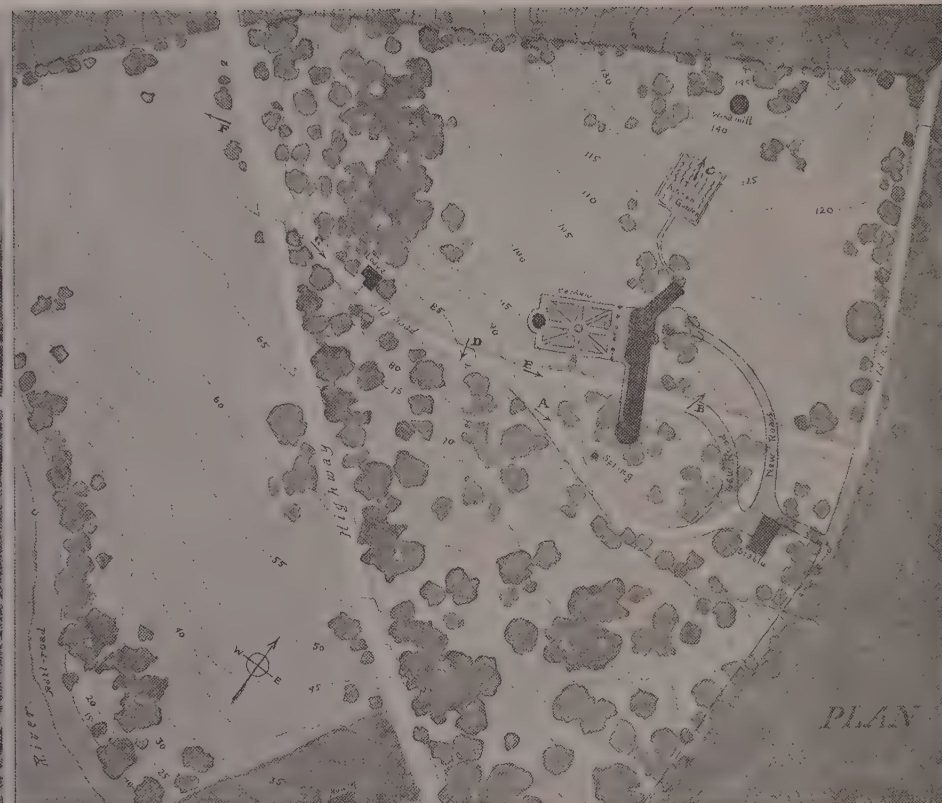


E

House designed by Andrews, Jaques & Rantoul, architects

F

G



A site on the Hudson River. A practical example. The contour lines are indicated every five feet. The points from which views are taken are indicated on the plans. The lighter portion of plan comprises the area of the site. (This set of pictures is extended on the opposite page)

stone wall retaining it. As the dip of the land below the road is considerable, it gives a view from above, through and over the trees to the south (see "D"). The land below the road slopes to the river, where a screen of trees effectually hide the railroad (see "F").

The soil is good. A few ledges crop out at intervals and the stone walls would furnish considerable building material.

The growth is largely cedar, oak and maple, with a sprinkling of locust and a few elms. This growth is very well distributed, and is even thicker than is shown on the plan, as the pictures suggest. The highest point on the land is near the northern line and, with the trees, offers an excellent wind screen.

So much for the present conditions. Now for the possibilities of the place. (On the plan the site is indicated as lighter than the adjoining property, and the existing roadways lighter still.) The fact that the old crossroad is semi-public is the only stumbling block, and at first this seems a serious objection. Remaining in its present location it makes the lot impossible, but there is nothing to prevent the extending of this road in line with the easterly portion, and thence by the easterly boundary to the highway below. This does two things—makes the westerly portion of the old road a part of the estate and gives a back way and service entrance through the new extension.

From outside encroachment we seem to be secure, as the highest land is on the lot and there is no chance to throw drainage across the property. Further, the lot is a mile away from one station and two miles from the other. The river road is not the main highway and consequently has reasonable chances of escaping the trolley. These facts offer a reasonable excuse for the non-interference of the mushroom class of house.

Having saved a portion of the old road, the next question is, what is to be done with it? It is important that this should be utilised, as its natural conditions are excellent. Let us see—the spring—yes, the spring is a feature and must come into the game somehow. A carriage driving in must make a turn in order to get out. Then why not make a loop to connect the two diverging forks of the road and solve the problem thus? In this way the overflow from the spring can be made a watering place for the horses and its present intention retained. The

A hill site in Dutchess County, N. Y. The knoll, sheltered by the oak growth to the north, is a good location

View of Frenchmans Bay from the lookout of a Bar Harbor house. This is very characteristic of the scenery of the Maine coast. This is an excellent example of the desirability of the elevated site. If it can be gotten without too much of a climb, or, in other words, if the raise be by easy and unfatiguing stages, it is the supreme location of all. The above answers every requirement of this sort and it is readily seen that its overlooking of its neighbours, increases its isolation from them and at the same time utilises their unusual perspective to enhance the natural beauties of the landscape. The value of a site of this sort can hardly be overestimated. Besides the foreground setting and the delightful islands in the middle distance, the sweep of the country across the bay, which is miles away, gives the outlook a bigness that is better and happier than the limited view of the flat site.

loop is interesting enough in character to be worth perfecting, and is a pleasing way of solving the problem of the drive.

As the stables should, of course, be handy to the drive, it has been indicated to the eastward of the loop and near the service entrance and the extension of the old road. If it is deemed too conspicuous in its present position, it can be put behind the trees farther to the south. In fact this suggestion seems a good one, inasmuch as it will solve one problem very nicely. The manure pit can be hollowed out of the face of the natural terrace, and be made with an arched stone or brick roof, with the chutes leading to it from above. As the wall faces the south a projecting outside pen can be added, and thus the pigs will be comfortably housed and one more bothersome question disposed of.

Old birch growth on the Maine coast. An excellent chance for the log or rough-plaster house

Naturally the first consideration would be the location of the house. In this instance, however, the disposal of the road, which we have already considered, was the important question. Then, too, one could see at a glance where the location of the house should be; and even if there were any hesitancy, the sunset across the river, the view through the trees and a glance at the wind-sheltering hill would instantly dispel it.

The ordinary thing to do would be to put the house on the upper side of the drive and let it go at that. Fortunately this is not an ordinary problem. The sunset and the river at once suggest a long frontage in that direction. Although we have decided on the upper side of the road, we still go back to the spring. Here is an idea—why not carry a wing of the house across the road, arching over it? In this case the billiard room and den can be placed on the spring side, where they become semi-detached from the main house by means of the arch, which is an advantage. Of course there will have to be a corridor from the main part of the house to the den, but this can, if necessary in rising to clear the arch, remain at that level, allowing the like raising of the billiard room and den floors, which will give a room below each of them. Thus there can be a storeroom under the billiard room, and the room under the den can be used for the pump, as the water supply naturally comes in at this point. The den should be carried up into a tower.

The main outlay is simply the dining room and parlour, with a wide hall between and stairs at the northeasterly end. The library is south of the parlour and next the arch. The kitchen and service are in an L to the north and at an angle to the dining room, so as not to interfere with the view. The service driveway comes in at the east of the kitchen, by the way of the stable. A deep veranda seems to be requisite across the front of the house, which might continue narrowly over the drive to the den. A simple formal garden can be placed to the southwest, with a summer house at its extremity, and on a line with the central walks and the hall.

On the crest of the hill to the north of the lot is a chance to erect a windmill for further water supply and for general use. This would be well in case of fire. Below the windmill, under the hill, where it would be sheltered from wind, exposed to the sun and handy to the water, the kitchen garden could be placed.

The gardener's or caretaker's lodge has been located on the upper side of the road at the old gate, as this location seems a good one. It might, perhaps, be shifted to the other side of the road, where it will be under the bank and lower. In this case the living room and sleeping rooms could be on a level with the drive and the kitchen and dining room below.

The drainage is easily taken care of. It might be carried to the lower ground below the natural terrace. It could, if thought desirable, be carried across the road into the field by the river, taking in the lodge on the way, and this would probably be the better method. Either would require about the same amount of pipe, considering one cesspool in both cases.

The open field across the road will allow of tennis courts and a large garden if desired.

There would, of course, have to be some thinning out of the growth in order that the best of it be given a better chance. With this, vistas could be opened up to such bits of view as were deemed worthy. On the whole, the plot is in remarkable condition for occupancy as it is, barring, of course, the right of way through it.

The house shown is merely to give an idea of a good style to follow. This excellent example is based on the French farmhouse, and it suggests something perfectly in harmony with the stone and the wood growth. The sky line of the "problem" house would have to be more vigorous, however, but this is a matter of adaptation.

There is another style that could be used on this site with equal success—that of the Italian—plaster walls or stone and plaster, and tile roofs. By this is not meant the larger and formal villas, but the simpler and more irregular creations of the hill towns and country. The cedar, which suggests forcibly the Italian landscape, we have in abundance, and the scheme is thoroughly practical. Under this treatment the spring becomes the Italian fount or well.

This general solution of the problem is, of course, not the only one, but it is somewhere near to a good solution and suggests the way in which such a problem should be considered. The rough plan came as a natural result of the existing conditions. The average builder would not, perhaps, get as far as to see the house outlay at once—it is not his fault if he does not.

A $12,000 house of field stone partially covered with stucco; a type common in English towns

CHAPTER II

Planning the House

IT IS a common saying that a man must plan and build three houses before he will get what he wants. Judging from the way in which he ordinarily goes about the job, there seems some reason for this statement.

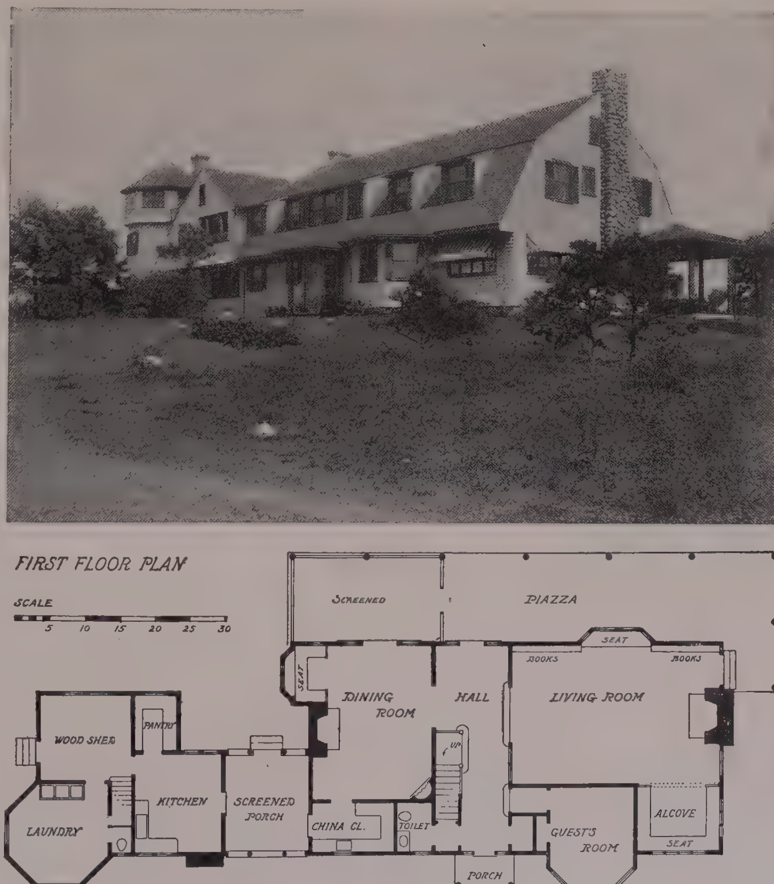
The planning of a house requires considerable thought and calculation. It is a most serious matter and should be taken seriously. The owner naturally has ideas of his own, and generally pitted against these are many time-tried conditions and the question of good design, as exemplified by the architect. We have said "pitted" for the lamentable reason that these things are generally antagonistic. It has been the common thing to consider the architect as one who wittingly lays himself out to spend about twice as much as the stipulated cost of the structure, and the owner as a confirmed crank who will antagonise any idea advanced by the architect and stick like glue to a few petty and insignificant notions. Both are of course false, and yet there is a reason for these things, and when they are thoroughly sifted the owner will be found all unconsciously responsible for the larger part of them.

If you have ever gone over the capitol building at Hartford, Connecticut, you will undoubtedly have heard the guide remark in conclusion: "And the most wonderful thing about it is that it was built within the appropriation," just as if this fact were a novelty—which it is.

It has always been a failing of the general public to expect about twice or three times the value of every dollar it spends. In the case of the building of a house, the prospective builder wants this and that and something else that he has seen, until the grand total has run up, without the slightest exertion, from the five-thousand-dollar limit to ten or fifteen thousand. It is so natural to want things, and so fatally easy.

To meet the wants of his client and in the hope of pleasing him, the architect naturally blunders into the same snare. Even at the risk of over-running a little, he attempts what he knows to be impossibilities. Often, too, he wittingly runs over in the knowledge that clients frequently have named a certain limit, with the predetermination of spending more if necessary. There are, of course, unscrupulous architects who intend to deceive and involve the client, but these, happily, are few. Unfortunately, though few in number, they may have done much to further the false notion of the profession at large.

There is another condition which does much to roughen the smooth relations between client and architect, and that is the remarkable self-assurance of the former. Does the average man attempt to plan a locomotive, a sailing vessel or the detail survey of a railroad? He goes to the expert, of course. With the house it is different. It is so simple—like "rolling off a log." The architect is only a copyist, anyway—he doesn't originate anything. Just here he makes a grave mistake. Yes, the average man can plan a house, and it may stand as long and as well as another; he can plan a locomotive, too, but will it ever get beyond the model room? The house

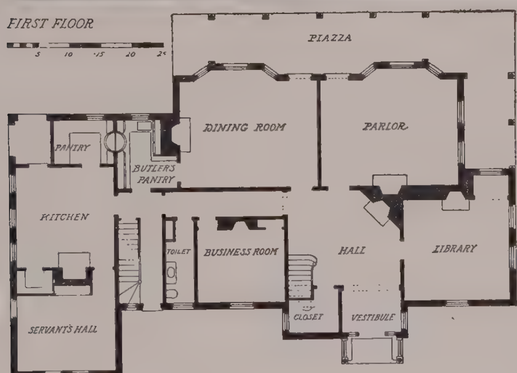


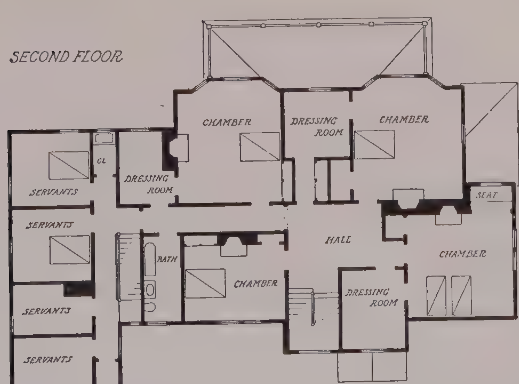
House at Osterville, Mass. An interesting solution of the summer problem.
Chapman & Frazer, architects

is an inoffensive and mobile animal. If it be tremendously ugly it won't explode, and if your front door opens into the kitchen pantry it isn't a locomotive that will not run. It is not a ship that will "turn turtle." If your roof should look like a number-ten hat on a ten-days-old puppy, or an impossible rail-road grade; if you do have to crawl on your hands and knees under a roof valley to get into the best chamber—still no catastrophe will occur, except perhaps a slow and sure arrival at the insane asylum. A man was once asked the question as to who designed his house. He replied: "My wife; Mr. So-and-So drew the plans." As the edifice was a little masterpiece throughout, and the wife of a very ordinary sort, it is readily seen at how much some people rate the architect's labours. There are some people of taste who are better fitted to be architects than many of the profession, but they lack, almost always, the intimate knowledge of the subject which tends to complete success. We frequently see and hear of houses "built without an architect." We cannot dispute the possibility; it is the result that we question.

Now if the client would only be willing to admit that the architect is master of his profession, and the architect in turn be thoroughly honest with the client and with himself, then things might run a little smoother and pleasanter than they often do, and the general results would gain very considerably.

The sensible way to go about the



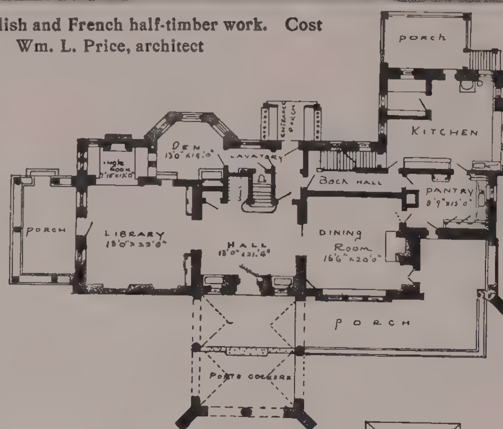


Brick and stucco house at Manchester, Mass. A simple and dignified rendering. Andrews, Jaques & Rantoul, architects

matter would seem to be by progressive stages. If you have an idea of what you wish, make rough sketches of it and think it over. New ideas come—put them on paper. If you can blunder through a drawing in any sort of shape, get a drawing board, T-square and triangle and lay the first plan out to scale. Then you will discover that the stairs will not go up within the space that you thought and that your pantry isn't large enough—just such things as you should discover, too. Calculate for furniture, etc., and when you have gotten what you think is right, make a tracing of it and take it to your architect. At this stage he should be made familiar with the proposed site, so as not to work entirely in the dark. He may then, too, be able to suggest things which you have overlooked or have not thought of.

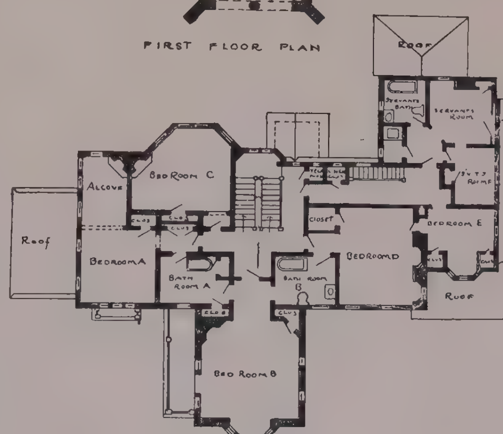
An excellent adaptation of English and French half-timber work. Cost about $17,000. Wm. L. Price, architect

Your architect should be chosen with care, and friendship should have nothing to do with the choice; such a combination of relations is often disastrous. You have probably seen some particular thing which you fancy; the man who did it is the man you want; don't get someone else to copy his design.



FIRST FLOOR PLAN

If you have no very clear idea as to what you wish, go to the professional man at once. In any case get rough sketches at first, so as not to make too expensive a job of it; if the finished plans have to be altered too much, the architect is apt to lose his interest and to neglect or slight yours.



PLAN OF SECOND STORY

While your outlay is being put in shape, try other schemes or keep on with the original sketch, trying to better it. This last can be done by making the

new sketch on tracing paper over the first. Keep all your efforts, as they are valuable for reference. Pick out the best features of your many attempts and try if they will combine; they probably won't, but try. Do not prolong your fun so as to make the architect too much work in changing and rechanging.

Log and stone house at Bar Harbor, Me. Designed and built by a local carpenter, and very suggestive despite its faults

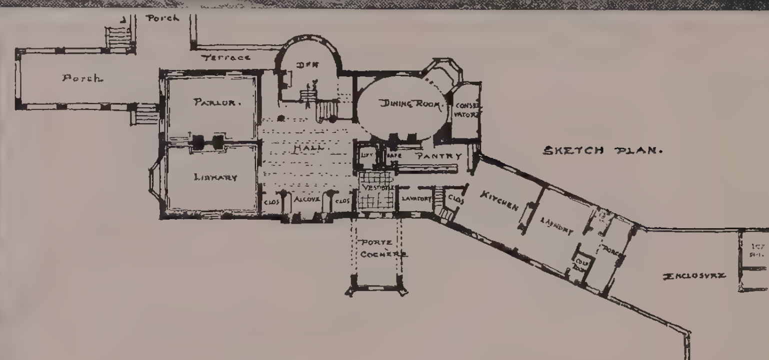
When your architect has delivered his sketch, go over it and sleep on it. If you think it is not as good as yours, tell him so in a pleasant way and he may tell you something you do not know, or vice versa. Try the tracing paper on that, but be sure that you understand thoroughly what the drawing means and learn how to read it before you condemn it.

The first floor is the most important; the second floor generally adjusts itself, and you can see in a general way how it will work out. After your first floor is settled, draw the second and attic and cellar, or let your architect have the first try at it.

It is important that you should take as much time as possible to think the thing out, but when it is satisfactorily settled go ahead. Mistakes and omissions are expensive, if one tries to rectify them during the process of construction, and it is very seldom that they can be satisfactorily rectified. If it be possible, the three-quarter-scale drawings (if any) should be finished up to the figures at the time the plans are to be estimated upon. In this way the client knows better what he is to get, the contractor has a fairer show, and omissions and mistakes are less likely to occur.

It is next to impossible to lay down many hard-and-fast rules to govern the planning of a house. Personal habits and ideas are all-important factors; and what might be inadequate for one man might be perfectly satisfactory for another. A few general hints will suffice to set the reader to thinking, and in setting these forward for his consideration we are doing all that can be done.

First, we should consider the convenience of the plan and its reference to every-day uses and the ease with which it can be kept up and cared for. Do

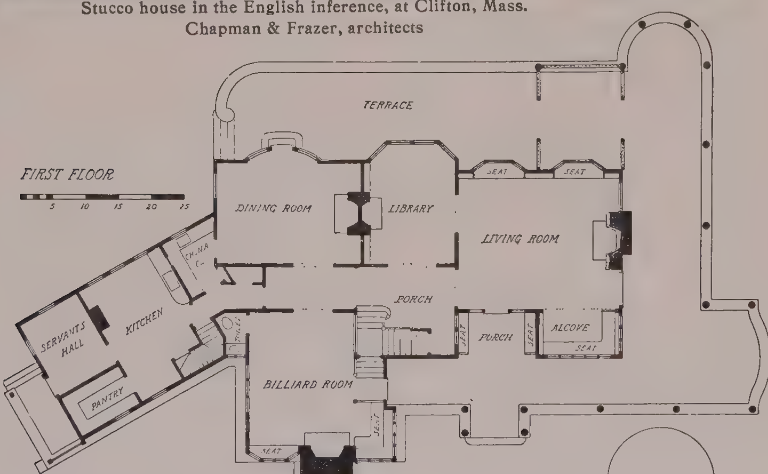


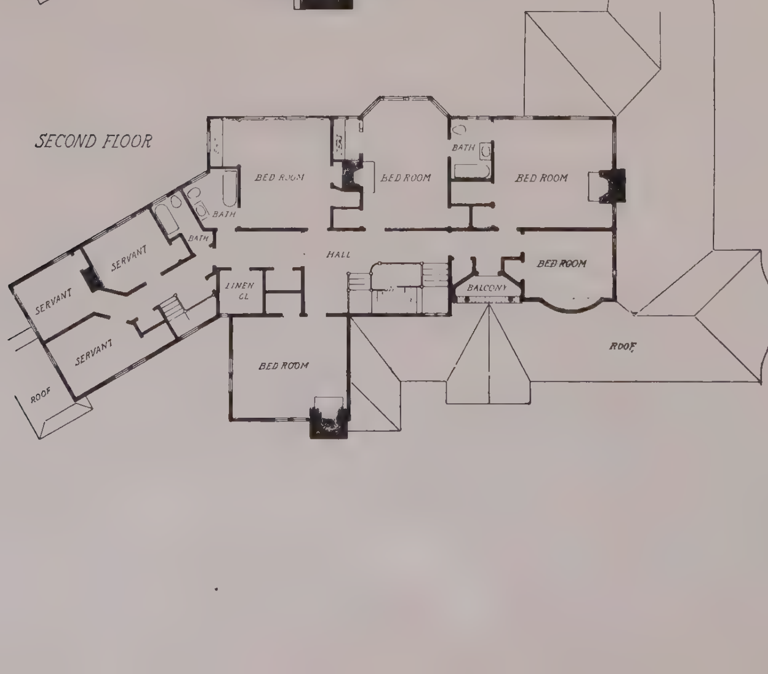
Residence of E. S. Sand, Esq., Southport, Conn. An example of well studied lines and composition. Note how closely the design has vorked out to the architect's sketch

Wilson Eyre, architect

not "bite off more than you can chew" is an old saying fit to be remembered. Consider as much as possible the working organs of the house, so that all who have anything to do with it, either owners, guests, servants or tradespeople, shall find what they want without too many steps or too much trouble. Nor should any of these conflict in any way in working of the general machinery. Consider the diverse points between which the most travelling is done, and bring them as near together as possible without conflicting with something else. It is not desirable that your servant should be obliged to climb over the dining-room table in order to answer the front-door bell. Make your plan simple and the rooms in natural relation to one another, and don't have to go through a room of a somewhat retired character to find one of a more public nature; as, for instance, through the library into the living room. When one is obliged to encroach on any one function to perform another it is bad planning.

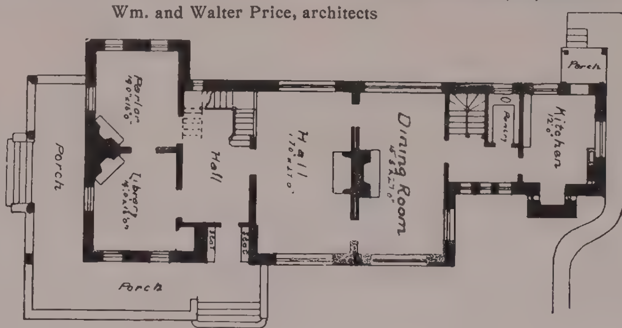
Stucco house in the English inference, at Clifton, Mass.
Chapman & Frazer, architects





Once upon a time a man bought an old Dutch Colonial farmhouse on a beautiful spot in the state of New York. Its exterior was charmingly simple and dignified. Not so the interior. The front door opened into the sitting room, and the servant was obliged to go through this room and the dining room to answer the bell. The front stairway led from the sitting room through a slit in the wall into a chamber, and they were as steep as a barn ladder. One night the head of the house got up to get the baby a little subjugator and neglected to light a lamp. First he tried to get into the servant's room, which aroused that terrified worthy to screams; then he tried the guest's room with like result. Finally he escaped through the son's room, only to fall part way downstairs in an effort to cross the landing. By this time the whole house was up and looking for the burglar.

An excellent example of English design, at Overbrook, Pa. Cost, about $12,000
Wm. and Walter Price, architects



Steps from one room to another and all places where one is likely to get a fall should be avoided. The making of one part of the house on a different level from the rest is picturesque enough, but is it worth the while? A confusion of doors is bad. For instance, not long ago an old lady who had occasion to arise in the night mistook the backstair door for that desired and, there being no landing at the top, she stepped off and fell to her death. Such backstairs should have a landing with a rope or gate across it at night, if by any chance they are allowed to exist at all.

Every house should have a permanent front and back vestibule or enclosed porch. This is important in order to keep out the cold, and further because there are often callers at both front and back doors whom one does not wish to admit further into the house. Then again the vestibule is an

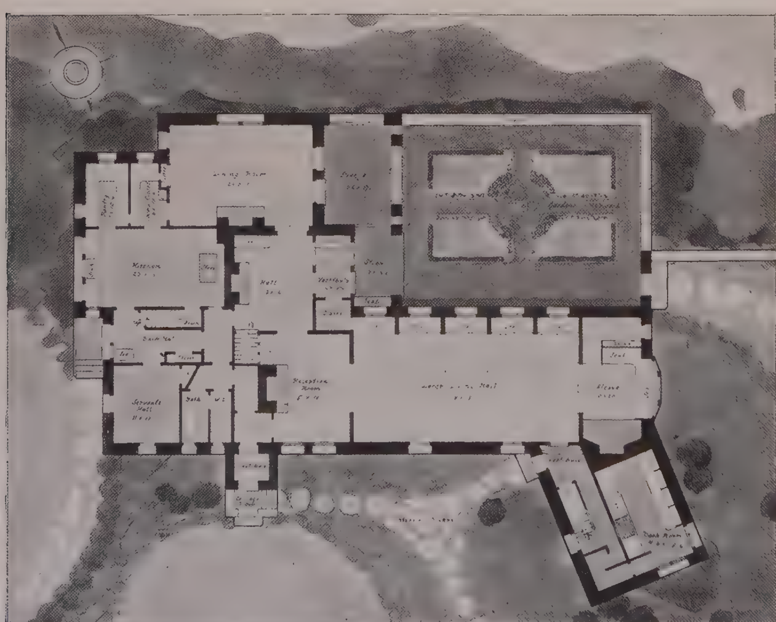
admirable place for storm clothing and umbrellas. The portable vestibule is ugly and generally unhandy.

It is well that there should be a direct and independent avenue of communication between the kitchen and the front door. The reasons for this are obvious.

The relation of the kitchen to the rest of the house is one of importance, the great difficulty being that the odour of the cooking generally permeates the whole establishment. The ordinary remedy is to arrange two sets of doors between it and the rest of the house, which is some help at least. A most excellent scheme is suggested in the plan of the "Osterville" house by Messrs. Chapman & Frazer. In this the kitchen is separated from the rest of the house by a porch, the opposite sides of which are open. This allows of a current of air, which is a most effective remedy for the pursuing odours of cabbage and the like. This, of course, is for a summer house, but it seems as if a modification of this for cold weather might be effected. A radiator with a partial screening-in might effect this.

It is often very convenient to have sleeping rooms on the first story, at least for the family use. It saves much running up and down stairs in cases where one is not wholly dependent upon servants. Every sleeping room should have a comfortably large closet; its convenience cannot be overestimated.

Bathrooms are usually located on the second floor, so as to be handy to the sleeping or dressing rooms. There should be a toilet on the first floor for family use and one in the basement for the servants.



Plan of the practical example on the Maine coast. The shore is shown closer to the house than it should be, simply to give the relation of lines. The sketch shows what might be done with the exterior

There should be a trunk room, and this should be located on the second story, if possible, where it is most convenient to the packing and unpacking. If not on the second story, it might be located on the floor below and be used for both trunks and bicycles. Sometimes, however, it is more convenient to place it in the attic.

Fireplaces are great ventilators, as

well as excellent to remove the chill or damp of the early spring or fall and frequently of a summer day.

From the point of view of the purist, every room in the house should be finished in the same style. To be more liberal and to help out the feeling and intention of the several rooms, there seems to be no objection to using several different periods of the style of the country, viz., Louis XIV., Louis XV. and Empire. This should not be done, however, unless absolutely necessary to carry out the purpose of the rooms. Such combinations as Colonial and Gothic are out of the question, although Colonial and Italian would do very well. In a Colonial house, for example, such an introduction as the Turkish is not to be thought of, unless it be applied to such a room as the den or others, out of the main group, and in a measure set off from the vital considerations of the plan.

The importance of the veranda in the planning of the country house must not be lost sight of. It should be at least seven feet wide, and wider if possible. If covered, it should not be allowed to darken the adjacent room; or, in other words, the room should have other sources of light in case the veranda side be insufficient. It is far easier to shut out light than to let it in. In a country where insects become an important consideration (and they have an insinuating way of forcing their attentions on one), a portion of the veranda should be screened in with access only *through the house.* In this way it becomes a part of the house, without the objection of going through an unscreened passage to get to it. If it can be located so as to be convenient for outdoor meals it is an advantage.

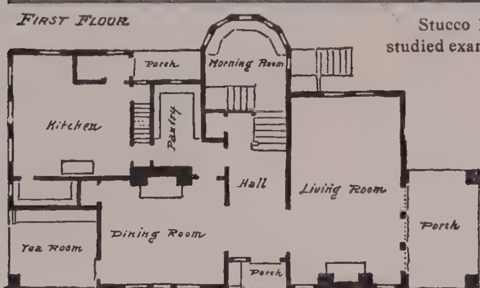
Plan and views of the site on the Maine coast. The upper view is of the site from the southeast, the middle is the view from site to the south, the bottom is a general view of the site from the southeast

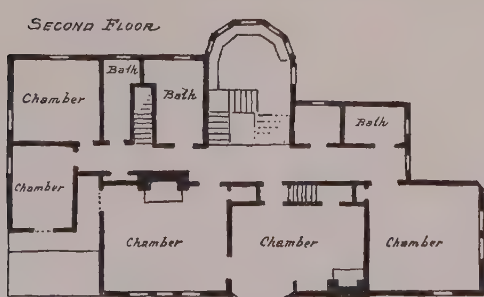
In some parts of California it is said to be necessary at times to go out of doors in order to keep warm. Under such conditions the sun parlour becomes a necessity.

As more can be learned in the actual going over of some particular problem,

let us consider the accompanying site on the Maine coast as a practical example. This has the advantage of being just such a problem as one would be called upon to consider. It is still an unsolved problem, and the reader starts with practically the same advantage as the writer. It is not the unsatisfactory question of how has it been done, but how is it to be done?

Stucco house at Glen Ridge, N. J. A well-studied example on English lines
H. Van Buren Magonigle, architect





There may be those who will fall in love with this site and wish to know where it is situated. Forbear, gentle thirster for knowledge, and know that this secret is jealously guarded.

The site is on the shores of a bay, contains about forty acres, and is about one-half mile from the main highway. As shown on the plan, it is irregular in shape and divided into three distinct divisions—a second-growth wood to the north, a cleared farm, and a triangular sheep pasture. The second-growth, which lies on either side of the private road, is mostly larch and white birch, with a sprinkling of spruce. The farm proper is cleared and has upon it a cottage house, a barn, a shop and another small building, all in fairly good condition. The portion of this part toward the bay is the mowing field. The pasture is freely strewn with rocks (granite) and has a fringe of trees along the shore, mostly spruce, pine and old-growth birch. The point is fairly high on the bay side, sloping back gradually to the road. The highest point on the site is about midway of the rail fence between the mowing field and the pasture. To the north of the farm building a small inlet runs across the private roadway. This suggests much in the line of future lay-out.

The soil is gravelly and of considerable depth, the whole front structure

being on a ledge foundation. This ledge, extending to the east, becomes destitute of soil, and serves as a breakwater to the cove. Off the shore to the south several lobster pots are set, showing the possibilities in that direction; on the cove side are generous clam beds.


Another view of the Glen Ridge house, showing how the thatch effect has been suggested in shingles

From the high ground one can see to the west the sunset across the water, to the south the sweep of the bay with the islands, to the east an alongshore view, and to the north the inland country with its hills and mountains.

It has been necessary to give a general idea of the plot, so that the reader can gain a fuller idea of the conditions than the pictures alone suggest.

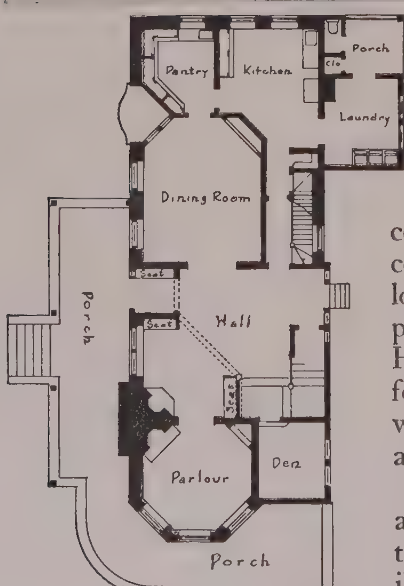
Now let us consider the problem of the planning of the house, the utilisation of the farm buildings and other obvious problems. In looking over the ground there seems to be but one place for the house, and that is to the easterly end of the pasture, just clear of the fringe of trees. This is shown in the two land pictures and the plan. Of course there are other good places, but this seems to be the best suited to the natural conditions, and furthermore is far enough from the shore to warrant the structure remaining a house rather than a lobster trap. It requires no disturbing of the growth to get the northerly, easterly and southerly views. The westerly outlook is somewhat shut in by trees on the upper side of the fringe; those below can be seen over, in a similar manner to those shown in the picture looking across the bay. It has the advantage, too, of not being too closely shut in with trees, as is the case with several other delightful spots in the midst of the growth itself.

Water can be gotten to the north of this spot, and the open space seems an excellent location for a windmill and a tank, both from its position and its height above the house site. We assume the water possibility from the fact that the farm has a good well near the top of the same ridge.

As the pasture is at the present time tenanted by sheep, which keep the herbage cropped to a velvety shortness, it suggests that this feature might well be retained, sheep and all. It is an inexpensive way of keeping the grass cut, as well as a most interesting feature of the place. If it

be found that they encroach too much on the immediate dooryard, they can easily be fenced out of that portion of it. However, they are not goats, and in any event will not get on the roof and devour the shingles.

The stable can be located on the slope of the hill near the pasture fence and just over its brow to the north, so that its drainage shall be in the direction of the garden.



A most interesting stone house at Wallingford, Pa. Cost about $7,000. Wm. L. Price, architect

The existence of the farm buildings is fortunate, from the fact that they can be rented to some responsible party or serve as the gardener's or caretaker's quarters. In any case a caretaker and fresh vegetables are assured. These buildings are, as previously stated, in fair condition, and could be put in first-class condition with the outlay of little money.

There is another consideration here which is most decidedly in our favour—the cottage could be used by the owner until his house is completed. He can spend his vacation here in looking over the outlay and gathering data for his plans, which can be put in shape during the winter. He can then be upon the scene of construction the following season—under the feet of the workmen—where he is sure to make himself generally disliked and have nice things said of him.

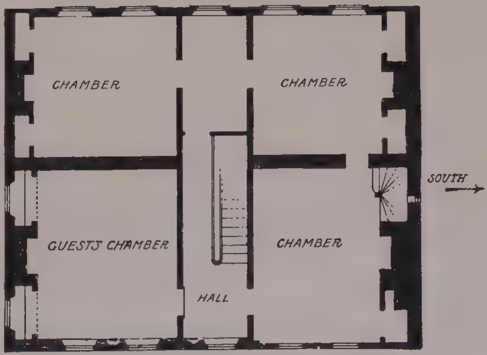
And now to the plan itself. After considerable scribbling on rough sketches, we have evolved the accompanying scale drawing as something to illustrate the possibilities. Its rooms have been

made of fairly large size, as it seems best that they should be. There has been no price restriction, but we must not be too extravagant. The scheme suggested would cost from $20,000 to $30,000 in the rough field stone of that locality. It might even be built for less. It depends largely on the inside finish.

The most important views being those to the west and south, the same should be considered in the laying out of the plan. The dining room has good views toward the bay and across the garden and the water toward the west and the sunset. There is also a window to the east which will allow the morning sunlight to enter the room. The living room has an extensive view of the bay, with the garden in the foreground, and through the open arch of the alcove a view of the sunset through and over the trees. This room has also two windows to the north, commanding a view of the approach to the house.

The old Royal House, Medford, Mass. Showing the simplicity of Colonial planning

FIRST FLOOR



SECOND FLOOR

It will be noticed that the long axis of the house is not due east and west; it seems wise that this should be rather in line with the point of sunset in midsummer. It makes no real difference, of course, and is a matter of individual taste entirely, its only advantage being in the long view thus obtained. As it is, a person standing on the reception-room hearth at this time of the year would get a clear, uninterrupted vista of over fifty feet through the three rooms, and this vista would continue on through the trees.

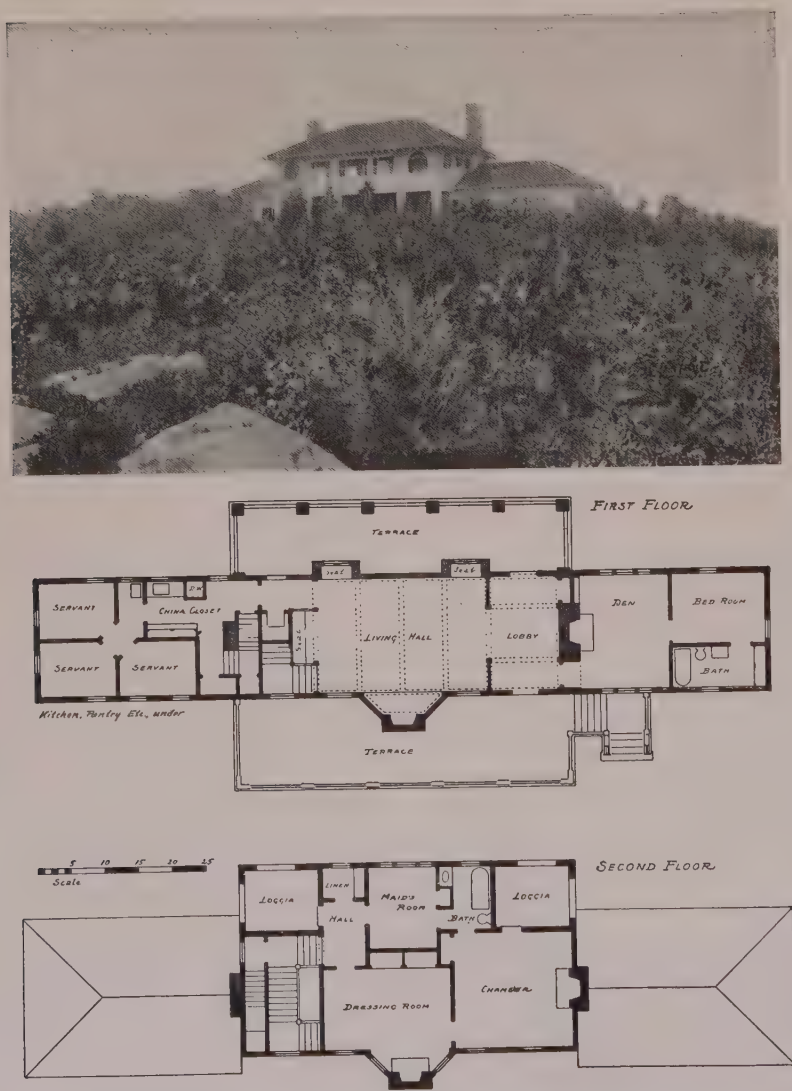
All the rooms are well lighted, with the light concentrated where

feasible, and have also considerable wall space, which is of course an essential.

The fireplaces of the dining room, reception room and alcove are made wide enough to take a four-foot log; that of the hall has a three-foot opening.

In considering the general arrangement of the house and the relation of one room to another, we naturally begin with the entrance. The north vestibule is shown in a projection; it might well, and perhaps better, be within the line of the main house; it is a matter of taste. It is, however, provided with a carriage stoop and horse block and should be surmounted by a hood. To the rear of the vestibule is a combination of passage and closet under the front stairs which allows of easy access to the toilet as well as hanging room for clothing at the back of the chimney. You can enter at once into the reception room, or by the passage, hall, and west vestibule gain access to the garden. It is through this entrance that guests would naturally enter, and, as will be seen by the plan, it is easy of access from the kitchen and yet well enough shut off by doors to make it difficult even for the odour of cabbage to escape by that route.

The west vestibule, which opens upon the garden, is in reality the family entrance, for it is more than likely that much of this traffic will be through the garden. There are large windows in its two walls to allow



A stucco house at Cohasset, Mass., designed on Italian lines. John Lavelle, architect

of the lighting of the hall, and a box seat to hold footwear. It would be better if this seat were located under the inside window and a door cut through the south wall so as to give access to the screened piazza, thus avoiding the passage through the dining room for ordinary use. The closet off the vestibule offers hanging room for over-garments, as well as a passage from the living room to the hall. This isolates the reception room and makes it unnecessary to pass through it in going from one part of the house to another.

Entrance side of Cohasset house

The piazza area is not extraordinarily large, because in its consideration the garden is made to count as an open piazza, the roofed-in structure being considered more from the point of an open-air dining room. If more be desired, however, it can readily be carried around the south side of the dining room. Although we have considered screens in this connection, it is not really necessary, as there are very few mosquitos in this locality. It is good planning, however, to provide against them, for occasionally a damp, warm season will liven up the pests considerably.

The dining room has access to the piazza through a French window, making it possible to set a table out of doors. Its connection with the kitchen is through the china closet, which arrangement, giving two doors in the interval, should in a measure keep the kitchen door from the rest of the house. The buffet is built in between the dining room and the china closet, with a slide between.

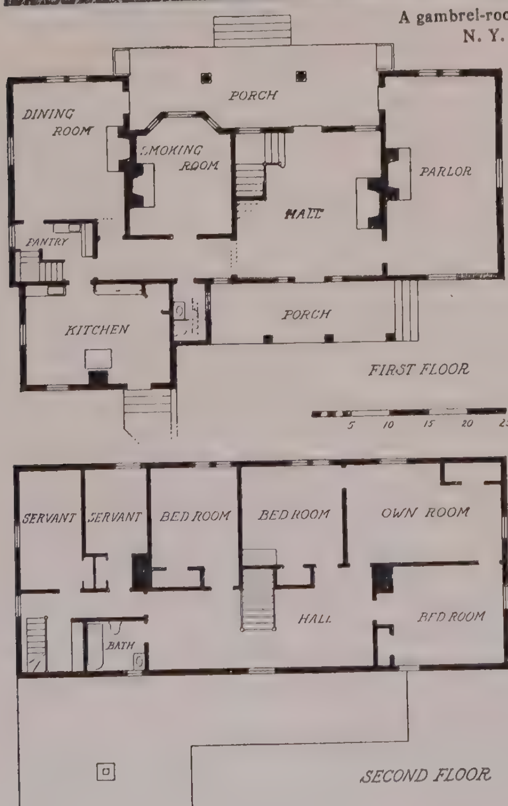
The pantry is placed on the southeast corner, and provided with two windows so that it may get what air there is stirring.

The kitchen is large and its outside walls are practically all glass. The sink is set in the centre of a 13-foot shelf, giving ample room on either side. There is also room for a table near the cellarway and a swinging shelf next the dining room. The kitchen is also handy to the back door, the back and cellar stairs and the two front doors, and has a clothes closet of its own in the back hall. On hot and close days the opening of the china closet door and window, the north kitchen window and the hall and back doors will give a relieving cross-current of air. The back stairs, having a door at the foot, will prevent the kitchen odours from besieging the second story.

The servants' hall, being across the hallway, is within reach of the kitchen and has a good easterly outlook.

The bath and toilet are separate, an evident matter of convenience. These are calculated for the family use. Although there is room for two bathrooms on the second story, it seems wise to provide for a tub below as an extra. The servants' toilet should be located in the basement and their bath in the attic.

A gambrel-roofed Colonial house at Kingston, N. Y. Wilson Eyre, architect



The large living hall is somewhat higher studded than the other rooms, and in addition is finished into the roof. This roof is supported by four rough-hewn and simple trusses. There are provisions for four window seats in bays, which can well be boxed in and provided with hinged covers. There is a step suggested between this room and the alcove. It was done with the idea of a tile floor, and as the alcove is an end motive and really a nook, the usual rule regarding such steps may perhaps be overruled.

The alcove is provided with a well-lighted seat and a large fireplace. A sort of bookstall is built in back of the seat, which in reality makes a reading room of the alcove. As the demand for a large library in a country house is a rarity, the shelf room shown is in all probability sufficient.

The L to the north has been utilised as a large photographic dark room in view of the beauty of the country in which the site is located and the great temptation, consequently, to make studies of it. This is perhaps larger than is necessary, and the portion next

the chimney might well be made into a storeroom. Access to it is had through the living hall as well as from the outside.

Before taking up the possibilities of the second floor some brief outline of the outside conditions may not be out of place here.

Owing to the wild and irregular outlay of the plot, any thought of the ordinary garden has been abandoned; and, besides, we do not wish it to be too elaborate. It is true that an informal rock garden, based, perhaps, on the Japanese, might well be used if it were not for the very suggestive shape of the plan. The idea of putting the garden into the angle of the house, thus squaring it up and making a terrace out of it, seems on the whole a good one. Its plan is simple, and not too elaborate to be taken care of by the lady of the house—that is, in a large measure. We should not think of inflicting the mower upon her, but the flowers are another matter. A sun dial stands at the intersection of the cross paths, bordering which are flower beds. A small hedge encloses the outer sides of the four small grass plots, and a hedge is planted against the south wall of the living room, bordering the main walk. At the intersections of the flower beds and the hedge are placed eight Roman pots filled with hydrangea or the like—anything which will make distinct spots. Although the garden is on formal lines, the flower treatment should be irregular in detail, to harmonise with the landscape.

The terrace is enclosed by a wall having in it seats opposite the cross walks. The entrance to it is through an arch in the extension of the westerly wall of the alcove. This entrance might well be provided with a stile to keep the sheep out of the flower beds.

The utilisation of small spruce and cedars, in moderation, about the house is to be considered. The cedar hedge between the main approach and service entrance is advisable.

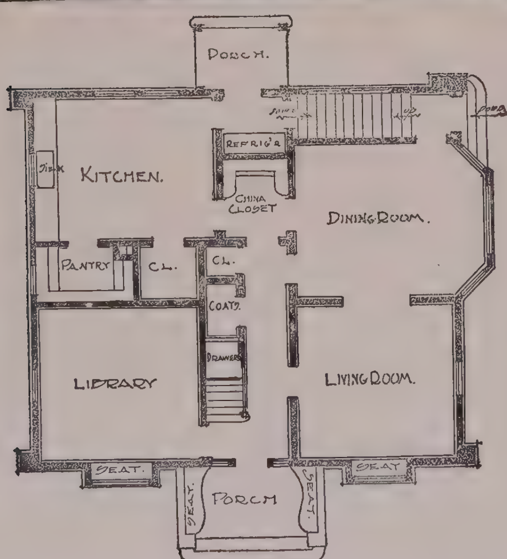
Instead of making walks through the short-clipped grass, flat stepping stones, after the manner of the Japanese, will be found more effective and in character with the scattered rocks. Edges to drives and paths could well be made of loose stone as indicated.

The second story has not been studied out to scale, but the first floor gives a fairly good idea of what it might be. There are chambers over the westerly part of the dining room, the hall and vestibule, the kitchen, the servants' hall and the reception room. The kitchen chamber can have a small dressing room over the pantry and the dining-room chamber one over the easterly part of the dining room. The bathroom can be placed over the china closet, with a door into each dressing room. The wall between the bath and servants' hall should extend up to the second story, and continue south to form the east side of the upper hallway. The space over the first-story bathroom should be left open into the hallway to light it. A bathroom should be over the front entrance, with doors into the hallway and the reception-room chamber. As the living hall is quite high, a bay could be made in the reception-room chamber, overlooking it. There can be two servants' rooms in the attic, one in the north and one in the south gable.

In the second story of the L and over the dark room can be a studio.

For this reason the walls have been made at an angle with the rest of the house, so as to get the straight north light. This could be a billiard room or a den if desired. Off this room and over the alcove can be made a balcony, which might serve as a music gallery in event of a dance.

An eight-room gardener's cottage on a large estate near Boston. Cost about $6,000. Coolidge & Carlson, architects



As this is the country of rough stone, it seems that it would be a most excellent material for the house walls. If laid in white mortar with not too deep a joint, so that the white of the mortar shall count, its effect would be excellent.

As to the general exterior, the small sketch shows what might well be done to make a simple big and solid structure, not too elaborate for the place. The pitch of the eaves suggests one type of Swiss châlet.

And now with these preliminary studies we are ready for the architect. Some minor changes will have to be made—we must expect that. We have made a beginning, however—a fairly good beginning, perhaps, because it is in the right direction. We have something to work on, something to pull to pieces, and without that we have nothing at all. Of course there are other solutions of the problem—that we granted at the start. This one may not suit you. If it does not, take a bit of paper and try it yourself; it is good practice.

It is not the writer's intention to go into the question of style; that is a long road and a half understanding of it would do more harm than good. The pictures shown illustrate the diversity of style, and the architect is the one to carry out this side of the problem. Of exteriors, in a general way, without regard to style, these few words might be said: Be simple and truthful in

your exterior, as you should be with your plan, and let the former be an honest interpretation of the latter. Keep the roof simple; the more valleys the more leaks. Keep the plan simple; the more angles the more costly, as the plan naturally expresses itself in the exterior. Make your material count for that material and no other; the slight suggestion is permissible, but the out-and-out attempt to deceive is bad; the grained door and imitation stone and marble come under this head. We may make a shingle roof to suggest the English thatch, or treat our wooden siding in the *form* of stone, but the first gives the line only and is so slight as not to deceive as to material, while the latter is not marbled.

In conclusion, remember that the best design is that which shows no effort to make itself interesting; the excess of ornament does not necessarily mean good design (in fact quite the contrary), nor the absence of it an inferior thing; and lastly, that it is the simple thing that wears and becomes less tiresome from constant use and long association.

House of Gen. Harrison Gray Otis, Los Angeles, Cal. An example of plaster mission work

A modern Colonial house showing the hip roof "decked" at the top.

CHAPTER III

Construction of the Shell

WITH the plot of the house roughly measured and staked out, it is best to make several soundings so that the character of the soil may be definitely determined. Clay is to be avoided at any cost, unless you can get below it for a foundation. Rocky or ledgy soil is apt to be infested with springs calculated to make a swimming tank of your cellar if you are not careful. This is particularly so when the rock itself has to be cut into, as it opens up veins and fissures likely to be permeated with moisture. Ordinary soil, too, has its ground water or moist strata, which stands at varying levels according to the season. To go below this is to attempt to drain the country. Don't try it unless there be a good chance to rid yourself of it. Soil elevations are usually above ground water, and in such cases perfectly safe, as the substrata is ordinarily level or has less curvature than the top soil, which has been exposed to washing and the various untold actions during its submerged condition.

It is always the best policy to make the soundings where the soil is supposed to be the wettest, and to a depth below that to which you intend to dig. In this way extreme conditions are tested, and some idea is obtained of just how near you may be *above* trouble.

Having definitely determined on the location of the house and roughly staked out the same, the first step is to remove the loam from the site and to such a dis-

tance from the house as it may be required to grade, or at least for ten feet, so that it may be out of the way of the working room. It should be piled in some convenient place, where it will be undisturbed and yet handy for future grading.

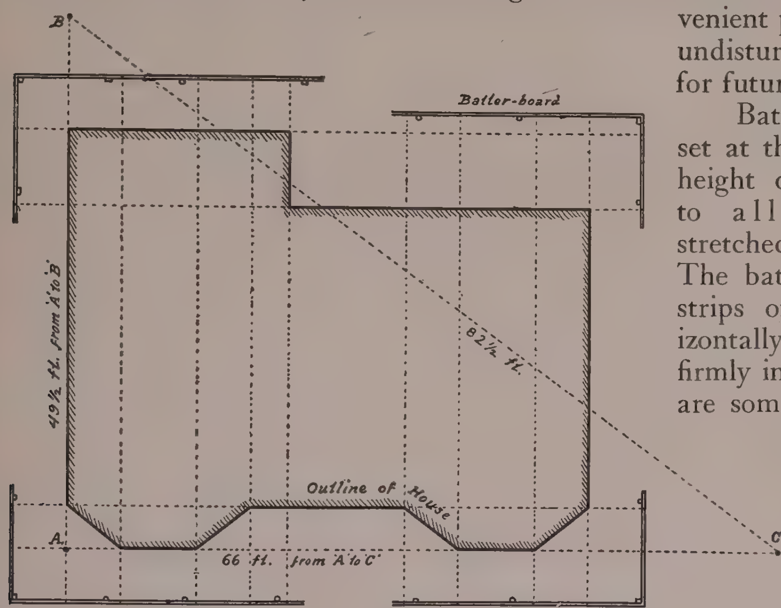


Fig 1. Showing the use of batter-boards in laying out the house

Batter boards are then set at the house angles at the height of the underpinning, to allow of lines being stretched across (see Fig. 1). The batter board consists of strips of boards nailed horizontally to uprights driven firmly into the ground. They are sometimes set about one-half inch above the required height so that the various lines can be notched down to the required level. First the principal wall line is established and the underpinning and foundation set off from these. In the case of the notches, the line is held taut by means of a brick or stone as a weight at either end; if nails are driven into the batter boards, to serve instead of notches, the lines are made fast to these and pulled as taut as possible.

It is always better to have a surveyor lay out the house. He is in the habit of being careful and accurate, and your edifice is less apt to be out of square or out of level than if laid out by another.

The excavation for the cellar should be made at least 8 inches larger all around than the outside of the foundation wall. This will allow for the

House at Lawrence Park, Bronxville, N. Y. A simple and vigorous example of stone and shingle work, with low-pitched hip roof. Wm. A. Bates, architect

pointing of the wall on the outside, and also a space to be filled with sand or gravel for the carrying off of water from the foundation.

The excavation should be made to a depth which will insure a cellar head room of 8 feet at least (see Fig. 2). The ordinary house, set on a level, requires $2\frac{1}{2}$ feet of underpinning above grade. If set on a side hill it may reduce the uphill side; the total light and air area should not, however, be less than in the level example.

The foundation trench should be 2 feet at least below the cellar level and of a width determined by the width of the building wall, which, in turn, depends on the weight of the structure and character of the soil. In case the cellar bottom is within reasonable distance of a known ledge, it is well to excavate the foundation trench to it so that an absolutely firm footing may be assured. If this extra depth is enough to warrant it, the width of the trench will have to be increased on the inside to allow the mason access to his work.

The foundation, usually of stone, is sometimes built of brick. Brick, however, is porous and is apt to chip and crumble with freezing, while the rough field stone withstands moisture and wears better.

Foundations should be laid in cement mortar, brought to a smooth face inside and out and thoroughly pointed on both. This repels moisture and vermin alike, whereas the common dry wall with only one face and rough projecting stones on the back invites trouble. This common form of wall is little more than useless. Being open at the back, the water passes into it, loosens the flimsy pointing and comes through into the cellar. The wet wall freezes and, aided by the projecting levers on the back, heaves itself out of shape. After the water and frost come the rats, and it is then simply a question of how long the wall will stand the combined inroads of these three.

The thickness of the foundation wall depends entirely, as already stated, on the weight it has to carry and the climatic conditions. The ordinary wall in New York and Boston is built of an even 20-inch thickness. In Bangor, Maine, and the vicinity foundations are built 3 feet at the bottom, tapering to 20 or 24 inches at the top. This is not merely a localism; the 20-inch wall has been tried and proved a failure.

Sometimes it may be advisable to line up the inner side of the foundation with brickwork. In this case it should be on a line with the inside of the underpinning so as to present one even surface, and it should be tied into the stonework by being built with it.

Underneath all foundations a footing course should be laid. This should project beyond the outside of the foundation several inches on either side. The amount of this projection as well as the depth is determined by the character of the superstructure and the soil. Six inches projection on either side and perhaps a foot thick is the average. There are two common ways of building a footing course. The simpler and less expensive form is to fill the footing trench with loose stone, laid dry, on which the foundation is raised. The loose footing in this case serves as a drain for such water as may find its way through to the cellar wall; the water is carried off in like manner through a blind drain of loose stones.

In the case of a brick or stone structure, the footing is made of large regular stones, each of which is of the full width. The drain may be a porous pipe laid outside the footing (see Fig. 2), or instead of the pipe broken stone can be substituted.

It is always best that the top of the footing course be at least 6 inches below the top of the cement bottom to insure the latter a dry surface.

All stone work should be well bonded; that is, each course or layer of stone should break joints with the course below it. This breaking of joints should be generous. In order to tie the wall together in its width headers are used. These are simply ordinary long stones, set with the length across the wall. The courses should occur frequently, say every 3 feet. A good mason will see to it that they do. In this way a portion of the wall cannot drop out at the bottom and cause trouble to the superstructure. The whole ties together as a solid mass.

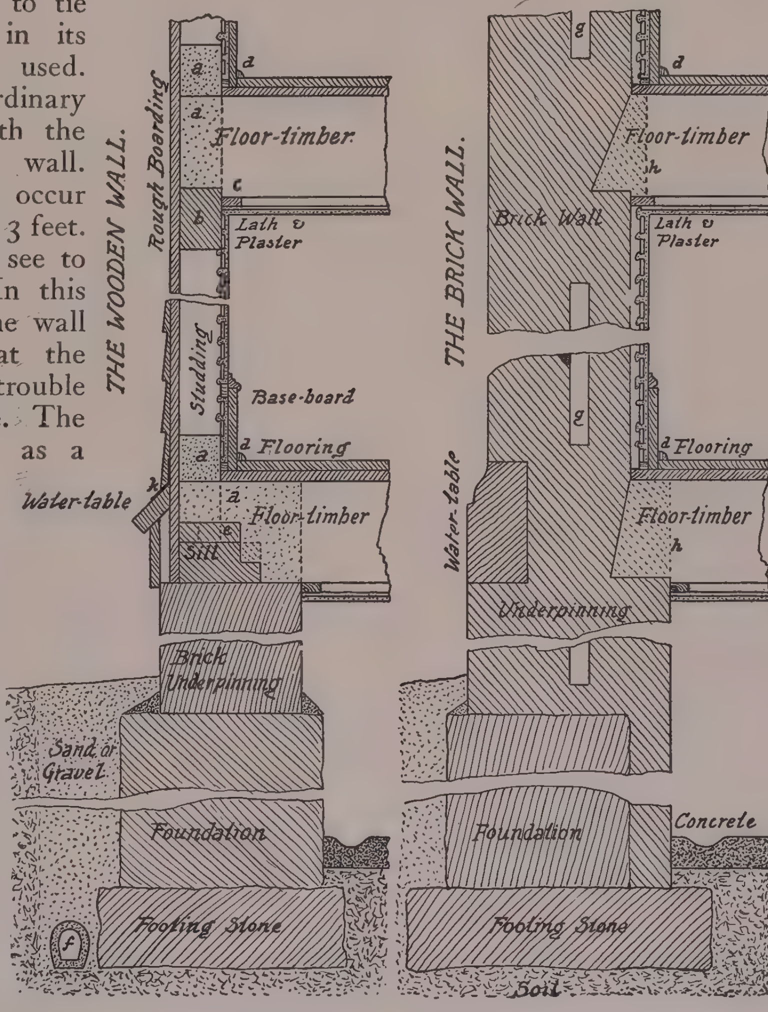


Fig. 2. Sections showing wood and brick construction

a. Brick fire stop
b. Sunk girts
c. Furring
d. Quarter round
e. Part of sill
f. Drain
g. Vaulting or air space
h. Fire stop
k. Flashing

The cement used for the foundation and all such below-ground work should consist of one part best cement to two parts clean, sharp sand. This should be mixed fresh as required, and not allowed to lie. A mortar consisting of one part lime, one part cement and two parts clean, sharp sand is good, but this mixture is not as strong as the cement alone.

Concrete for the cellar bottom should consist of one part best cement, two parts clean, sharp sand and three parts screened pebbles or very small stones. This should be at least 3 inches thick (4 is better) and be finished with a skim

coat of cement. It is best to make the flooring with a slight drain about the outside wall (see Fig. 2), with a trap at the lower end entering the drain. This drain should on no account enter the sewer or house drain. There is no need of extending the area of possible trouble any further than is necessary. It is not probable that with the ordinary precautions water will enter the cellar, but if it should this will be found of much value.

Mortar for exposed brickwork or stonework should consist of one part best cement, one part lime and two parts clear sharp sand. Pure lime mortar may answer, but the above is better.

The underpinning, the portion of wall between the foundation and the first floor, is, in the ordinary frame dwelling, of brick. This should be laid close with struck joints, having a course of headers every sixth course; this effectively ties the wall together. A "header" brick is one laid with the end or head to the weather; its length extends into the wall, forming what is termed a "bond" with the rest of the work. The "stretcher" brick is laid in the ordinary way, length to the weather.

Central motive of the Hammond House, Annapolis, Md. Hip roof with pediment projection. The projecting courses between stories emphasise the floor line

Often the underpinning is rough or cut stone, which is laid in the manner of its kind.

The cellar piers are usually built of brick, one foot square, from a stone footing below the cellar level, and provided with iron caps. Sometimes iron posts are substituted, and even 4-inch iron piping has been used with success on light structures. The iron cap is essential, however, for the secure support of the girder, since it does not shrink as does the ordinary wooden cap. The iron post has the advantage of less bulk than the brick pier without corresponding loss of strength, which is often a very great consideration.

The framing of a house is an important consideration. It should not only hold together but be rigid as well. The frame that will jar when the baby falls off the divan is not a rigid frame. The form of construction may have varying details common to various constructionists, but its main principles are substantially the same.

The braced frame is the old-fashioned form of our ancestors. Being usually made of spruce, its timber dimensions are less than were those of the old oak frames, in which the corner posts projected into the room.

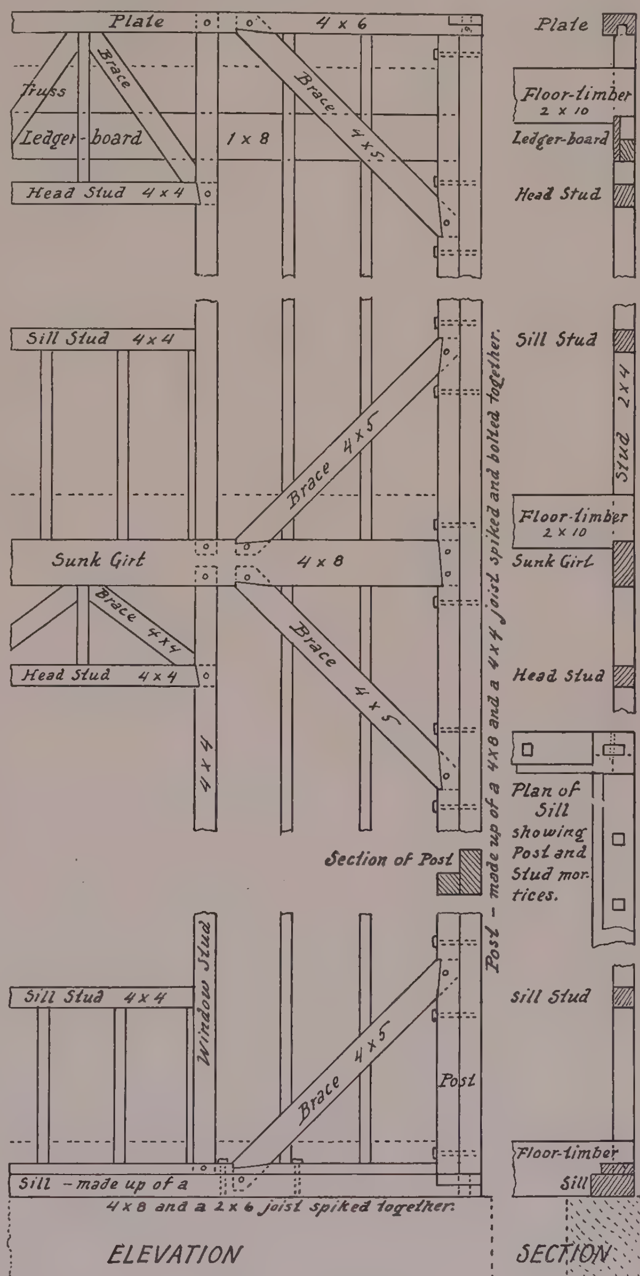


Fig. 3. Braced framing

The sill, the foundation member of the frame, is usually of 6 x 8-inch stock, set upon the underpinning 2 inches back from its outer face. Commonly it is merely laid there, but it is far better that it be bedded in mortar to shut out any draft which may find access through slight inequalities of the wall. In some instances the sill is bolted to the foundation, the bolts being built into the wall and projecting above it through the sill; nuts and washers are then affixed from the top. This will prevent the superstructure from taking French leave, without the knowledge of the foundation.

The sill shown in Figs. 2 and 3 is made up of a 4 x 8 and a 2 x 6 spiked together. This is done for certain reasons which will be explained later.

The common method of joining the intersecting angles of the sill is to "halve" them together. A mortise is cut through the two halves to allow the tenon or tongue of the post to enter. The halved sill is then spiked together, and the post, when in place, secured by a wooden pin passing through the sill and tenon.

The ordinary post is of 4 x 8 stock. We prefer the post made up of a 4 x 8 and 4 x 4 (see Fig. 3). This is as strong one way as the other and will stand cutting away for brace, girts

etc., better than will the single stick. The two sticks, having different grains, tend to an increase of strength in their combination.

The sunk girt is placed at a height sufficient to receive the ends of the second-floor timbers upon it, and is framed into the posts and pinned. The raised girt is set on a level with the top of the floor timbers and, like the sunk girt, framed into the posts. Both girts are commonly 4 x 8 sticks.

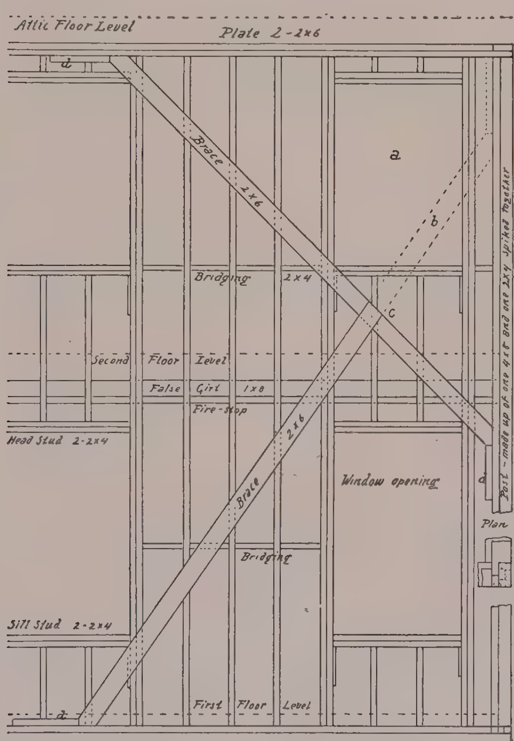


Fig. 4. Balloon framings

The plate, the capping member of the wall frame, is ordinarily 4 x 6, and this is small enough. Like the sill, it is halved at the angles and mortised to receive the post. It may be made up of two 2 x 6 pieces spiked together, which form has its advantages.

The braces have an obvious office—they preserve the plumb and rigidity of the frame. The braced frame, unlike the balloon frame, can stand alone, and is complete in itself without the aid of temporary support. It is always advisable, in instances where the braces are framed into a made-up sill or post, to "lag bolt" the members of the made-up timber together; the strain is such that ordinary nailing is apt to loosen (see Fig. 3).

The ledger board which supports the attic floor timbers is of 1-inch stock let into the inner side of the studding. In comparison with the girts it appears weak, but it is really stronger than it looks. It is held firmly on edge; thus its depth, which is its strength, is not allowed to become impaired by twisting. This and the support afforded by cutting into the studs make it adequate for the purpose.

Window and door studs, usually 4 x 4, can be made up of two pieces of ordinary studding, but the single stick is perhaps better for the braced frame. They are framed in, at each end, to the horizontal members.

The head stud, which forms the top of the window or door opening, should be framed on as the tie beam of a miniature truss, which, coming under girts and plate, helps to support them, and at the same time prevents the head stud from sagging and bearing on the door or window frames, which would happen were the truss omitted. Of course, for the ordinary opening, the girt would change but very slightly, if at all; yet the brace makes a more rigid structure, and one less liable to jar, which is the aim of good construction.

The sill stud receives the weight of the window, and should be made secure. It is not necessary that it should be framed in. An ordinary piece of boarding

under each end, nailed to the upright frame stud with the common "jack" or short studs between, will support it.

Common studs are usually 2 x 4 and are seldom framed into the larger timbers, although this may be done. If securely nailed they will be found strong enough. If they are to be framed in, the mortise should be but slight, so as not to cut away too much wood from the large timbers. In such cases, too, the made-up sill (see Fig. 3) will be of advantage, as all the mortises can be cut before it is spiked to the 4 x 8; and as these mortises can be cut through it, the actual labour is less.

In a large house it may be advisable to make the common studding 2 x 5. In such a case the upright sticks should be increased accordingly.

Studs are commonly set 16 inches on centres. If more rigid work is required, they can be 12 inches on centres. As ordinary laths are 4 feet in length, and as it is desirable to lay them without any more cutting than is absolutely necessary, one or the other of these spacings should be adhered to with accuracy.

Properly speaking, the balloon frame is one in which the frame alone is not self-supporting, and the studding runs continuously from the sill to the plate. No braces are used except temporary ones; the outside boarding, laid diagonally, is depended upon to hold the frame together and in shape. It is not advisable, however, to construct a balloon frame without the brace in some form or other. Hence the "long brace" is employed in the better work of this sort.

Fig. 4 shows a section of balloon framing with a good form of bracing. The sill is laid in the ordinary way. The posts, which are usually simply nailed at the foot, should be mortised into the sill and held in a perpendicular position by the use of temporary diagonal stays. The window and door studs are made up of two 2 x 4 studs, one of which should be mortised into the sill. The common studs are securely nailed at the foot and carried up to irregular heights, spaced and held by temporary stays, as already stated. The first floor timbers are set in place and enough of the under floor covering laid loosely upon them to work on. The "false girt," which is the same as the "ledger board" of the braced frame, is then let into the inside of the studs, and the second-floor timbers put in place and floor boards laid loosely upon them. The height of the plate is then calculated and the uprights cut off or spliced out to

Showing rough stuccco walls, with pitch roof and overhanging gable

meet it. A 2 x 6 timber is then nailed across the top and another laid upon it, breaking joints at the corners; this forms the plate. As is often the case, the attic floor timbers are laid on the plate, although the "ledger board" can be used if a higher story is desired.

After the rough skeleton has been erected, and prior to boarding in, the "long braces" are set in place and securely spiked to all points of bearing. They are of 2-inch stock, let into the outside of the frame, and are made as long as possible. The example shown is a common and awkward corner in which the simple form of bracing is utterly out of the question. If the window "a" were not there the straight brace could be used as shown by "b." As it is, the other brace from the post to the plate is necessary. The joint at "c" is halved and consequently weakens the brace; it should be reinforced by a 2-inch strip at the back. The cleats "d" are used to keep the brace from slipping. The latter is not framed in at the ends.

"Maxwell Court," Rockville, Conn. An excellent example of clean and healthy design. The low hip roof is decked to reduce the height, and thus add to the effectiveness of the long lines. Charles A. Platt, architect

It will be noticed that the head and sill studs, like the upright window studs, are made up (securely nailed together). This method, if properly carried out, is strong, effective and economical inasmuch as it often uses up short pieces of studding that are too long for bridging.

The balloon frame, however, has its limitations. Window and door openings should come over one another, otherwise the framing becomes much weakened and complicated. The fact that a window is omitted in the motive does not matter. If the window "a" were omitted, the double studding need not of necessity run to the height of the plate. The ordinary stud is merely reinforced up to the false girt. This is one of the advantages of the made-up window stud.

Prior to boarding in it is necessary to see that the false girt and plate are straight and true. The balloon frame at this stage is apt to be very shaky, having no heavy girts to keep the wall in line. This straightening process is effected by diagonal braces laid flat on the second and third floor timbers or up-

right braces from the floor to the member in question. These braces should remain in place until the permanent braces are substituted. The outside boarding, the under floors laid diagonally, the braced partition and the partition bindings are effective agents to the desired end.

It is important that the boarding in of a balloon frame should be laid diagonally, as it is a most effective brace in itself. If its direction be changed several times on the same wall surface its effectiveness will be greatly increased.

Ordinary floor timbers are of 2 x 10 stock; this, of course, in cases where they can be supported without too great a span. Lower floors are, under ordinary circumstances, easily supported on girders and piers in the basement; other floors, however, must be made self-supporting. It is better to lean toward the side of strength and rigidity than to calculate too closely.

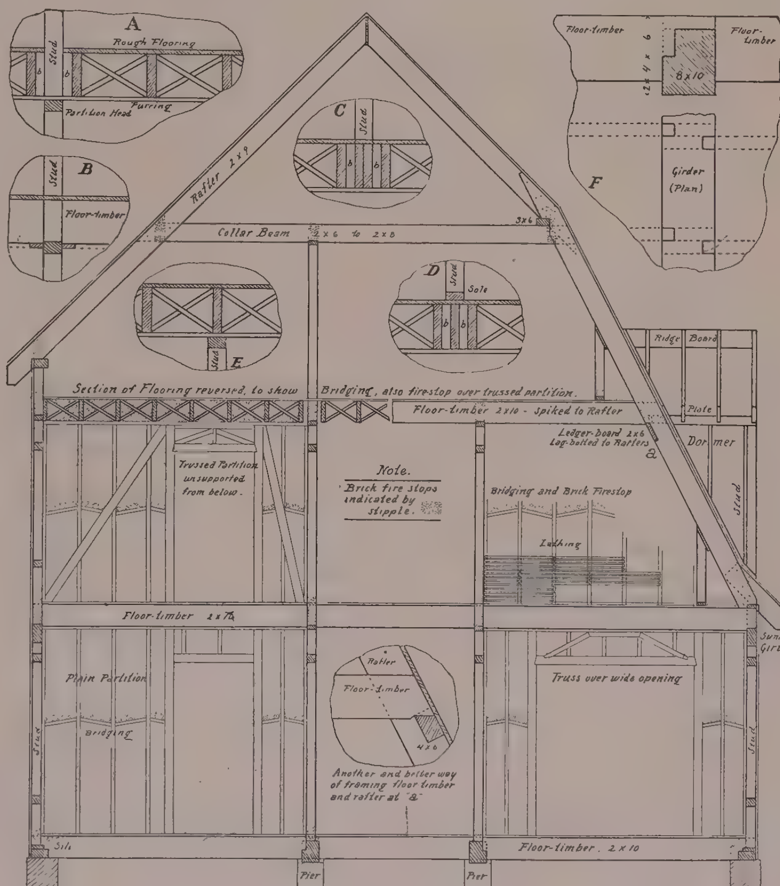


Fig. 5. Section through frame of house

It is not only that a floor will bear the weight imposed upon it, but that it will do so without too much sag and will not give. Such things tend to crack and dislodge the plastering and make a spring-board of the house in general. We have advanced beyond the Colonial methods, in which the timbers, though bulky, were comparatively slight in depth. It is the depth that counts. It is safe to abide by the following rule, which, though it may be slightly excessive, is in the right direction. For a 12-foot space or under, use 2 x 10 spruce timbers, set 16 inches on centres and cross-bridged two to three times.

For 12 to 15 foot span use 2 x 10 spruce timbers, set 16 inches on centres, and every other timber "doubled" up (two timbers spiked together) and cross-bridged three to four rows.

For 15 to 20 foot span use 3 x 12 Southern pine timbers, set 16 inches on centres, crowned one-half inch, and cross-bridged 4 to 6 rows.

For 20 to 25 foot span use 3 x 14 Southern pine timbers, set 16 inches on centres, crowned one inch at 25 feet, and cross-bridged 6 to 8 times.

A floor timber is "crowned" by making the centre slightly higher than the ends and the profile a slight curve. This is done to overcome a natural settlement or sag, and to prevent the floor from being hollow or "dished" in the middle. Ordinary short space need not be crowned.

Theoretically the floor timber sets on the girt or partition head, without alteration of any sort; practically, because of the variation in depth, they are "sized" or notched at the bottom so that the tops will all be at the same level when set in place. The amount of cutting out is determined by measuring from the top. Floor timbers should be selected so that their crowning edges come at the top. If they have no crowning edges such should be worked out. They are framed or notched to the sill and girder alike, their points of bearing being nearly at the same level. "F" in Fig. 5 shows the framing of floor timbers into the girder, with 2 inches of the sticks lapping at the top so that they may be nailed together and to the girder.

A simple cottage, showing what can be done with a combination of hip and pitch roofs

Floor timbers are cross-bridged at intervals not greater than 6 feet, and frequently less, by the use of 1 x 4 strips set in a straight line in a double row (see Fig. 5). They are firmly nailed to the floor timbers by two large nails in each end, thus forming a sort of truss which not only stiffens but distributes the weight as well

Partition studs are usually 2 x 4 and spaced the same on centres as are the outside studs. They are of one-story length only, and have heads and soles or their equivalent (see Fig. 5). Where set on line with a girder they set directly upon it, the girder taking the place of the sole. The head is commonly a 2 x 4 spruce stick, but it is much better if made of 3 x 4 Southern pine.

The head of a partition which receives the floor timbers should be set at the height of the sunk girt, so that they may be sized upon it (see "B," Fig. 5). If the partition extends two stories or more, the head of the lower partition becomes the sole of the partition above it (see "A," Fig. 5).

A partition running parallel to the floor timbers above, and extending only one story, should set under a floor timber, so that no sagging of the floor shall

depress the ceiling furring and crack the plastering, as would be probable if the partition came between the timbers (see "E," Fig. 5). If it be thought necessary to introduce a fire stop on the partition head (and it is perhaps better so), two beams should be "straddled" 4 inches, with straight bridging between, so that the partition may come in the centre and the interval above be filled with brick and mortar.

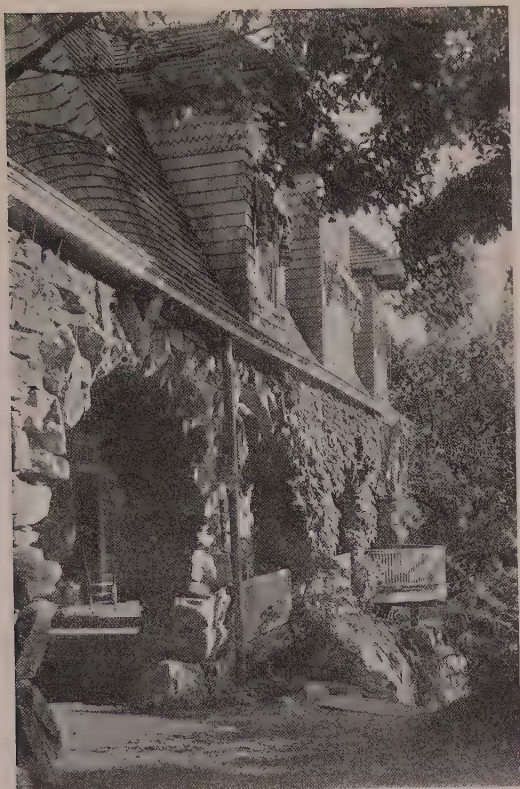
A partition running parallel to the floor timbers and extending through it should have a space of 2 inches on either side between the studding and the floor timbers, so that the finish may be properly nailed (see "A," Fig. 5). This space is straight-bridged and the interval between the floor timbers is filled with brick and mortar.

A partition unsupported from below should be trussed (see Fig. 5). If it be set across the floor timbers, the sole should set on the rough flooring. If it be set with the floor timbers and is light, the floor timbers under it should be three in number, separated to admit 2-inch straight bridging between (see "D," Fig. 5). Ordinarily two floor timbers straddled $5\frac{1}{2}$ inches apart are made to do this work. Three are better, however, as it takes but comparatively little to sag a floor. If the partition be heavy, as in the case of two stories, four timbers may be used (see "C," Fig. 5). The two centre ones should be spiked together, forming a sole for the studding, and the two outer ones straight-bridged and 2 inches from the sole on either side. If the partition be very heavy a regular truss partition must be made.

House at Bronxville, N. Y., showing a large pitch roof with unusual dormers. Walker & Morris, architects

Partitions, as well as outside walls, should be bridged. This can be done

with straight bridging (see Fig. 4), or better, by giving it a little incline, so that it may be drawn tighter. This last method has a tendency to adjust itself to the shrinkage of the studding, even if loosened, which advantage the straight bridging has not. The weight of the brick stops helps to assist this (see Fig. 5).



Showing rough stone and shingle in combination

The roof, which ordinarily is, and should be, very simple, often offers some quite complex problems in framing. In fact it is, perhaps, in this last form the most difficult framing problem. We shall deal with the simple problem alone, even to the exclusion of the dormer, which is but a small edition of the main roof and the wall framing.

The origin of the pitch roof is very old; it was used by the early Greeks and Romans entirely. It slopes or pitches away from the ridge toward the two opposite sides, forming a triangular wall surface, called the gable, at either end. When this gable is detached from the main wall, as is the case in Greek and Roman temples, by the horizontal return of the lower members of the cornice, it is called a pediment, and includes the whole triangular motive.

The roof as we know it is framed with rafters, notched into the plates and meeting at the ridge on either side of a ridge pole. The common rafter is of 2 x 9 stock; it is not advisable to make it smaller in a main roof, although the small dormer rafters are often made of 2 x 4 stock. To keep the rafters from kicking out at the bottom, tie or collar beams are run from each rafter to the one opposite and secured by spikes. Thus the tendency to force the outer wall outward is obviated. Ordinarily the collar beams are likewise the ceiling timbers of the attic rooms. When the attic-floor timbers are set on the plate they make an additional tie.

With an irregular plan we generally find the main roof intersected by a lesser roof at right angles; the line of this intersection is called the valley. In framing, one valley rafter is carried to the main ridge and the other intersects it at the height of the ridge of the smaller roof. The valley rafter should be heavier than the common rafter. With the ordinary 2 x 9, it should be 2 x 12; if a larger roof, 3 x 12 or 14. In the latter case the common rafter is likely to be strengthened also.

The hip roof, like the pitch roof, is composed of straight planes from the ridge to the eaves, only that instead of pitching two ways it pitches (in a square

plan) four ways, being thus somewhat pyramidal in form. In this type the gables are eliminated by the pitch of the roof. The hip rafters (those which come at the return or intersection of the several roof planes) should be heavier than the common rafters—practically of the same size and strength as the valley rafter.

This form of roof is very strong and is well adapted for large houses, where dormers will admit of enough lighting area for the attic, or for small houses where the attic is used for little else than a storeroom, and little light and head room are required.

The gambrel roof, so common in the Colonial farmhouse, is most artistic, and very practical for the purposes for which it is designed. It consists, as in the case of the pitch roof, of two sides sloping in opposite directions, but, unlike the simpler form, each of its two sides is made up of two distinct pitches. Although these pitches vary and have no rule to govern their actual relation, still they are always alike, in that the lower pitch is comparatively steep and the upper much flatter (see Fig. 5).

It will readily be seen that the idea is to eliminate one story, and, at the same time, by making the lower pitch steep, to gain considerably more space and head room than the simple pitch roof would give. The lighting areas are gotten through dormers, and much good small closet and drawer space can be had where the lower walls are furred in.

The framing is comparatively simple (see Fig. 5). A plate is required at the intersection of the two pitches on which the rafters rest, and, overlapping one another, are spliced. The lower rafters rest on the plate proper, and often in the modern work, though not always, a short false rafter is used to give a slight "kick" to the eaves. Ordinarily the lower pitch embraces but one story. If it is desired to include more, the floor timbers are framed to the rafter with a ledger board or some similar substitute, every other timber being spiked to the rafters as a tie beam. It is essential in this case that the floor timbers should be at right angles to the roof, rather than parallel to it, thus finding a bearing and effecting a strong cross tie at the same time.

Portion of old Whipple House at Ipswich, Mass., showing the overhang effected by the use of a large projecting girt

After the framing of the walls is complete and any member out of line has been braced or shored into proper position, the rough boarding is put on. This is usually of spruce or hemlock and should be of $\frac{7}{8}$ stock, planed on one side to avoid uneven thickness, and laid with the planed side out. It is not necessary that this boarding be matched; in fact it is just as well that it is not; nor is it imperative that the joints should be

laid absolutely close. Rough boarding is seldom of absolutely straight edge, and if laid as it comes leaves more or less irregular joints.

In the old work of the braced frame the boarding was laid horizontally. This is a good method, and saves both time and labour. The nature of the balloon frame, however, demands that the boarding be laid diagonally. Its direction should be changed several times on each wall surface so that the bracing shall be effective both ways.

House at Chestnut Hill, Mass., showing the transition of the gambrel to the pitch roof; the cottage to the two-story effect

Although there are those who insist on the horizontal boarding for the braced frame, yet the additional strength afforded by the diagonal boarding is no small factor toward the general rigidity of the whole. Theoretically the braced frame is rigid, and in oak the reality comes close to theory; yet as we build to-day it is far from being true practically. Of course it is almost impossible, under the conditions imposed by present methods and materials, to make the frame structure so rigid that it will not rock a little. And it is for this reason that it is wise to take advantage of every stiffening and strengthening method that can be easily used.

The roof boarding should be the same as that used for the wall. Here again, in the case of the pitch or gambrel roof, the diagonal boarding can be used to advantage, as these roofs have no absolute braces in the framing. The hip roof, on the contrary, is, from its construction, self-braced, and the boarding can be laid in the usual manner.

Sometimes the roof is simply covered with horizontal strips, spaced so as to receive the shingle nailings. This, at best, is not a first-class method for what is to be considered a good kind of house, although it may do for the simpler summer house or camp. It has one advantage, perhaps, that of the ease with which a leak can be detected and located as compared with the difficulty of doing so in the boarded type.

Under floors should be of matched hemlock of even thickness, laid close and diagonally to insure a breaking of joints between them and the upper floors. Ordinarily the under floor is laid in line with the upper floor, and at right angles to the floor timbers. As it is necessary that the upper floor breaks joints with the lower, this method requires some diligent watching on the part of the superin-

tendent, owing to the paper used between, which renders it most difficult to detect the unbroken joint. The diagonal under-flooring obviates this difficulty. In the case of the parquet floor, the underfloor should run at right angles to the timbers.

Sometimes but one floor is used, but this is a decided mistake in good work. It causes noise and dirt. With the shrinking of the floor boards come cracks, and through the cracks come cold air and dust; and if we lay a carpet it will rise and swell like a toad.


"Foregate," the summer home of Mrs. Gordon Prince, at West Manchester, Mass. A simple, clean and well-balanced design. Andrews, Jaques & Rantoul, architects

Brick walls are, in the ordinary forms, simple of construction. They may be solid or vaulted. The vaulted wall is one in which an air space, usually of 2 inches, is left in the inside (see Fig. 2). This space extends from the bottom to the top and is cross-tied so as to form a practically solid wall; the space about the floor timbers is filled in solid. It is readily seen that increase of width and stability is thus obtained, without increase of material and very little extra labour. There is another advantage—the ordinary brick wall is more or less porous and apt to take in moisture, and this air space keeps the moisture from penetrating the inner shell. It can be used as a ventilation flue, which, furthermore, serves the purpose of keeping the space itself fairly dry. This vaulted wall is an outside wall feature, not an inside one.

Generally speaking, an outside wall should not be less than 12 or 14 inches thick, and if in the lower of the two stories, 16 or 18 inches is better. An interior wall which has to carry any considerable weight and is of normal height should be 12 inches thick. This will answer for the first and second stories, but the cellar support should be 16 inches thick. An 8-inch wall should not be used to carry any great weight; it may be used in the attic or for small partitions, but never in the outside walls.

The method of setting floor timbers in a brick wall is simple and unique (see Fig. 2). As the bearing is ordinarily 4 inches, the bottoms are sized that distance in from the ends. The ends are then cut away, from 4 inches at the top to nothing at the bottom, so that in case of fire the falling timbers will not act as a lever and pry the walls over, as would be the tendency if they were square. It

is also well to leave a little space all around the end of the beams to allow a circulation of air and thus prevent dry rot.

At intervals of not more than 8 feet in the length of the wall the floor timbers should be "anchored" to it. This line of anchoring should be continuous through the building fiom side to side. The anchors are usually made of $\frac{1}{2}$-inch flat iron bands, $1\frac{1}{2}$ inches wide and 4 feet long, turned up about 4 inches at one end, while the other is perforated for attachment to the beam. The turned-up end is built into the wall just behind the outside face course and the bar carried back along the side of the beam and spiked to it.

"Eastover," at Wyoming, N. J. Joy Wheeler Dow, architect

The stone house is built of a stone "facing" for effect, backed up with smaller rough stones or brick, the whole being bonded and tied together with anchor irons. These irons should be galvanised, and are usually of one 12-inch iron 1 inch wide. They are turned up at either end in opposite directions; one end is rounded for insertion into the stone, the other turns up on the inside of the wall. As the drill hole is from $1\frac{1}{2}$ to 2 inches from the face of the stone the length of the anchor is easily estimated.

In the case of a rough field-stone wall the lining is often omitted; the wall is laid entirely of this stone and studding set against it. In this case it is important that the usual brick fire stops be not omitted. In a stone or brick wall the plate is bolted to its top. This is done by building in the bolts at intervals of from 4 to 6 feet, so that they will project above the wall and through the plates. The washer on the bolt head which sets into the wall is usually a stout strip of iron about 12 inches long.

Wooden laths are 4 feet long. When the studs are 16 inches on centres there are three nailings to a lath; when 12 inches on centres there are four. They should always be laid horizontally, three-eighths of an inch apart, with joints broken every 6 to 4 courses (see Fig. 5). If the joint is broken every lath it makes a better job, but this is not as convenient as the other method nor as common. Above door and window openings the laths should extend over to the next stud beyond the jamb in order to prevent cracks in the plastering.

The same rules will apply to the ceiling, only care should be taken that the furring is straight and true before lathing commences.

In the case of the brick wall, the furrings are fastened to the brick work and the laths laid on them in the usual way.

A modern development of the Colonial, retaining the simple lines and tall pillars of the earlier days. Henry B. Alden, architect

Wire lathing has many advantages, and where it can be afforded should by all means be used. It is applied to the studding and furring, and usually by means of staples. Where used it should be of the heaviest, so as not to sag in the intervals between supports. The fact that it is non-conbustible and holds the mortar very tightly makes it far superior to wooden laths, and worth the extra expense.

As the projecting corners of a chimney breast or other similar features are quickly destroyed, if of plaster, it is best to use the angle bead (a $\frac{3}{4}$-round wooden or metal member), which, fitted to the angle before plastering, receives it, and is not so liable to be damaged as the plaster corner.

It is always best that the plastering be carried to the floor. In this case two grounds are necessary, one at the bottom and one further up at the top of the baseboard. This gives a secure nailing for that member (see Fig. 2).

A simple New York State type of Colonial cottage, of old-fashioned long shingles. Cost $5,500. Lord & Hewlett, architects

As the face of the ground denotes the face of the plaster, the thickness of that member differs with the two and three coat work—three-quarters of an inch for the former and seven-eighths for the latter.

While plaster is sometimes applied to a brick wall, it does not, at the best,

make a good job, owing to the little hold it has upon the bricks. Should it be required, however, the first rough coat is omitted.

Although with care the two-coat work can be made a creditable job, yet the three-coat method is preferable, inasmuch as the final result is surer and better. In the former a rough "scratch" coat is first applied, and then finished with the "skim" coat. In the three-coat work the "scratch" coat is first applied as in two-coat, being forced through the lathing to insure a good clinch on the back. The surface is then scratched with a comb to present a rough, adhesive surface for the next coat. When dry the second or "brown" coat is applied and brought to an even and true surface by means of straight-edges. Over this the final or "skim" coat is laid.

Back plastering is applied to the inside of the rough boarding of a frame house to exclude cold and heat, and consists of one rough coat. Coming between the studs, the lathing must be cut to fit, and in order that the plaster may adhere the lathing should be furred off from the boarding by using a lath in each corner. If these furring laths are set out from the corners about half an inch, it gives a chance for the corner plaster to clinch, which is still better.

NOTE.—It should be remembered that the various woods specified in this chapter, and in fact throughout the book, are those in common use about New York and the East in general. Other parts of the country have their natural substitutes for many of these.

Court side of Royal House, at Medford, Mass., showing the combination of wooden side walls with brick ends in which the chimneys are placed

A mission house showing the effect of plain stucco walls

CHAPTER IV

Details of Finish

PRIOR to putting on the wall covering all the outside finish must first be set in place.

Cornices are of two sorts—box and open (see 1 and 4, Fig. 6). The box cornice is based upon the old classic models, whether it comes near to the original lines or not. It is an attempt to produce stone lines in wood, and shows nothing of its own true construction. In thus attempting to reproduce one material with another it falls under what is generally considered a bad architectural practice. Owing to the very extended custom of its use, however, it has come to be generally considered as an exception to this rule. As used in the better examples of Colonial work, it has become in a measure distinct from the classic by the reduction of its general scale and also the scale of its details. This fact serves to set it apart from the heavy proportions of stone.

Another form of cornice is that seen in some of the English and French work. It consists in the gutter or gutter moulding, with a smaller moulding below. Its projection is but slight, and in appearance and construction it is but little more than part of the wall itself. As the principles of the other cornices cover it so thoroughly it will not be further considered here. Commonly this cornice is Gothic, and is usually employed with that style.

The simple form of box cornice is constructed about the projecting ends of the roof rafters, which are cut off vertically at an established distance beyond the house walls. Only one series of furrings is necessary to complete the shell —horizontal pieces to which the plancia is attached (see Fig. 6). The nose of the gutter should be in line with the top of the roof boarding, so that the extra height given by the shingle shall insure the free passage of sliding snow over it; this is an insistent rule. If a wooden gutter is used, the fascia is tongued into the under side of it, and ordinarily the plancia is tongued into the fascia. This makes a tight box of the cornice, which is rigidly insisted upon in spite of its serious drawback.

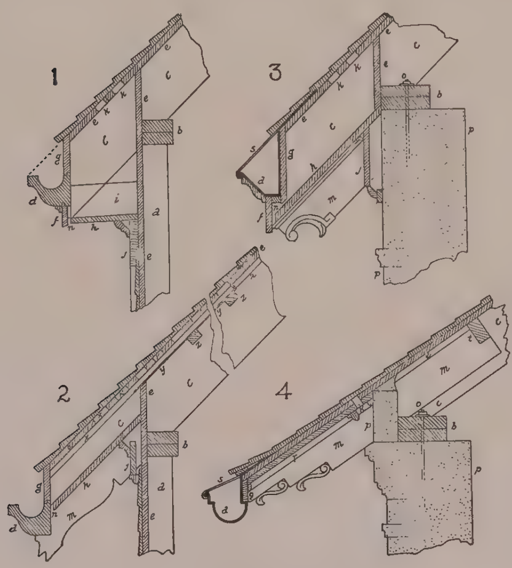


Fig. 6. Section of wooden cornices

a. Stud
b. Plate
c. Rafter
d. Gutter
e. Rough boarding
f. Facia
g. Shingle facia
h. Plancia
i. Cornice furring
j. Freize
k. Water outlet
m. False rafter
n. Drain
o. Plate bolt
p. Inter rafter filling
r. Sheathing finish
s. Gutter hanger
t. Header
x. Rafter furring
y. Zinc water-shed
z. Support for zinc

Owing to the fact that snow, gathering, as it does, on the lower edge of the roof, is apt to melt and back up under the shingles, the above method does not seem wise for Northern localities. Water comes in, stains the walls, peels off paint and paper and destroys the plastering, and still no means are taken to stop it. With the steep roof this is unlikely to occur, but with the roof of less than 45° it is almost certain. Of course it will be understood that this mishap is not of very frequent occurrence; but as one visitation is enough to do considerable damage, and as its repetition is a constant menace, some means should be taken to obviate it.

Portion of house near Philadelphia, Pa., showing good balcony and veranda motive. The cornice, while suggestive of the open type, is really a box cornice

One remedy is to leave an open space between the shingle nailings in the roof boards overhanging the wall, or to lay the shingles at this point on strips. To prevent the collection of moisture in the cornice box the plancia is pitched slightly, and where ordinarily tongued into the fascia, a one-quarter-inch space is left. This space, being in shadow, will show very little (see 1 Fig. 6).

Another method of treating the plancia would be to tongue it into the fascia in the usual way, after having cut notches into the tongued edge 3 inches wide and 6 inches apart and deep

enough to leave a quarter-inch slot when in place. In some types of cornice this would perhaps make a stiffer job than if the slot were continuous.

In any case the slots or drains should be covered on the inside with copper netting of small enough mesh to prevent bees, wasps and the like from filling the cornice with nests and music, and thus inviting further trouble by their presence. This fixes the cornice box, but unless the projection is considerable there is still the roof above and inside the wall line. This roof surface can be taken care of by stretching a wide length of zinc or painted canvas across the rafters from a

"Maxwell Court," Rockville, Conn. Charles A. Platt, architect. This is a most interesting example of brick and stone work designed on Italian lines. The wooden cornice is of the box type and is well proportioned

point outside of the wall line toward the roof. Seven-eighths-inch furring strips are laid on top of the rafters to receive the shingle strips and to make a space between them and the zinc. The latter should be brought up through the roof, at the top edge, and tacked down to the upper side of the boarding under the shingles (see 2, Fig. 6). The sheathing paper should be omitted between the boarding and shingles in this sort of construction. By the above methods much annoyance and damage to the interior and contents of the house may be avoided.

The true open cornice is not boxed in at the bottom but open, showing the rafter ends which support it. These last are usually more or less ornamental,

and originally were the true rafter ends. In order that it shall not be absolutely necessary to space these last equidistant—an almost next to impossible thing, owing to construction problems—we, in our modern work, have made use of the false rafter. This member is spaced without regard to the true rafter, and is carried inside the wall line and framed to a header, becoming in this way part of the roof and self supporting (see 4, Fig. 6).

Entrance motive to house in Swampscott, Mass. Allen & Kenway, architects. The house is of brick and stone; the hood and columns of wood

Another form of so-called open cornice is that in which the true rafter, or a portion of it, is carried beyond the wall line, and, being sheathed in on the underside, is embellished with false rafters spaced below. This is not a true open cornice, as it is not true construction. It is commonly called so, however, and, being somewhat cheaper than the other, is more commonly used (see 2 and 3, Fig. 6).

Stones used for cornices are laid one upon another, in the usual way, the joints being at the lines between the various members of the cornice. It is important that each stone should extend within the outside line of the wall for a greater distance than it projects, so that it shall not depend on the anchor irons for support. It is not well that it should depend on these irons alone, for if the roof is destroyed by fire the falling cornice may prove a grave danger. Solid wooden gutters are usually 4 x 5 for an ordinary small roof and 5 x 7, or even larger, for a large roof. Sometimes the wooden gutter is made up and lined with lead or copper. This makes an excellent gutter, better even with the copper lining than with the lead. It is, however, necessary in this made-up type to support it on galvanised-iron hangers. The size and spacing of hangers, as well as the distance to which the lining shall extend under the shingles, are governed by the same rule as that which applies to the metal gutter (see 3, Fig. 6).

A good gutter can be made from heavy galvanised iron, although that made from 16-ounce copper is far superior. The metal gutter (or the metal lining) should extend under the shingles for 16 inches and be secured by galvanised-iron tacks or screws. The nose is turned over an iron rod to secure its rigidity. The hangers should be of galvanised wrought iron, extending 2 feet under the shingles and spaced 2 feet apart. If the metal gutter be formed so as to present one or two horizontal planes in opposition

to the vertical ones, the general stiffness of the member is increased (see 4, Fig. 6).

All gutters should pitch slightly in the direction of the conductors, so that the water may drain off. In the old hand-made gutter this pitch was worked out in the gutter itself, one example showing it to have been 1 inch in 15 feet.

In the machine-made gutter of to-day the pitch is slightly less, and is gained by inclining the gutter on the fascia, or, in the case of the open cornice, by making the rafters longer at the point of outlet. Whatever method is employed it should not be made so marked as to be detected.

Conductors or leaders are best made of copper; galvanised iron or tin does well enough for ordinary work. The fact that they can be replaced without pulling the house down is one excuse for the less expensive and less lasting material.

The connection with the gutters is through a piece of lead pipe or "goose neck." For the ordinary roof this should be 3 inches in diameter, and the conductor, if round, 4 inches. Although the round gutter is the most commonly used, yet the square patterns are better from an artistic standpoint, and fully as effective. Whether round or square they should be corrugated. This should be rigidly insisted upon. The thawing of a conductor choked with ice is almost certain to crack or burst it, owing to the fact that substances expand with an increase of heat. Conductors are often made with ornamental heads which add greatly to their looks.

The conductors should be securely fastened to the building, and the foot entered into a drain provided for the purpose. It is best, under ordinary circumstances, that the drain be a pipe rather than a blind drain of stone. A short section of piping may lead to a blind drain, if the pitch be sufficient, with good results. Sometimes the conductor may enter the house drain to connect with the sewer.

For an ordinary good roof first-grade clear cedar or cypress shingles should be used. Though not as good as the hand-shaved split shingles, they answer very well. On a roof of 45° or a steeper one they should be laid 5 inches to the weather; on a flatter roof the weatherage should be diminished. It is hardly safe to use shingles as a roof covering when the pitch is less than 30°,

Entrance motive to house at Peterboro, N. H. John Fox, architect. The feature hangs together well and the effect of long shingle is well managed

owing to the tendency of water to back up under them. The width of a roof shingle should not exceed 8 inches, owing to the tendency of a wide shingle to curl and crack. They should break joints at least one and a quarter inches, and no joints should be made within less than an inch of a nail head. Galvanised nails should be used, with two nailings to a narrow and three nailings to a wide shingle.

Entrance to a brick house at Cambridge, Mass. The trim is of wood, a common practice in Colonial work

The roof should be covered with thick sheathing paper, stretched flat, well lapped and nailed through tin washers. The shingles can be laid on this or, better, on seven-eighths furring strips, leaving an air space between the shingles and the roof covering. If this space be filled in with mortar it makes an excellent fireproofing. For the slate covering the roof would naturally have to be made stronger than for shingle.

If slate is to be used, the roof boarding should be matched to offer a further obstacle to sifting snow. As slate does not lie quite as tight as shingles, this is necessary. As to the size of slate, there seems to be some difference of opinion. The preference, however, leans toward the 9 x 18 inch, which is a medium size. Slate should be laid 7 inches to the weather—no more. If laid in mortar they are less liable to breakage in nailing, and a cooler roof is also obtained. There should be two nailings to each slate, galvanised nails being used.

Entrance motive to house at Locust Valley, L. I. Babb, Cook & Willard, architects. An excellent example of the Elizabethan treatment in brick and stone

Slate, though an excellent fireproofing agent, is out of harmony with the ordinary frame house. With the formal Colonial or half-timber structure it is not so noticeable as with shingle walls and the like. In a locality where considerable wood abounds, or where the nearness to other structures makes the flying spark a menace, the question of the slate roof is not to be considered lightly. Under such circumstances it is unequalled by any other material.

In a climate where snow is a rarity the tile is an excellent roof covering. Its effect is that of corrugation, and it is commonly called "Spanish tile." As

it is now made, it is more like the old English "pantile," that is, having half of the vertical surface convex and the other half concave. The convex portion over-

Living side of house at Kingston, N. Y. Wilson Eyre, architect. This shows an excellent piazza with flanking benches. The blinds, in which the lower panels are solid, are worthy of note

laps the concave and sheds water into the latter, which acts as a vertical drain. The old Spanish tile was made of half-round sections, a series of which laid concave side up were overlapped by a series convex side up, producing the same result as the pantile.

In Northern latitudes, where it is desirable to get the tile-roof effect, as in Italian design, it is best done in copper. Roof covering is made of this metal in the tile form, and is most excellent.

If a plain flat copper roof is to be used, the sheets should be tinned on the edges, so that they may be soldered. The proper weight is 16 ounces.

The ordinary tin roof is expensive in the end, owing to the constant care that must be lavished upon it. Copper, the initial cost of which is more, requires little attention and wears indefinitely.

If a house be located in an isolated spot and is left for the winter without a caretaker, the copper roof is in constant danger of being stolen and sold as junk. This has actually been known to happen. Thus you may suddenly return to a roofless house.

The best material for flashing is copper; next to that is lead, which is, however, hardly second best. There are two methods of flashing, that of the long and that of the short pieces.

The first method consists of using long strips of metal, ordinarily from 16 to 20 inches wide, laid lengthwise of the angle and soldered together. This is tacked at the edges, with the roof covering overlapping it (in case of valleys), or vice versa (in the case of hips). In some parts of Maine the open valley done in this way shows some 2 feet of flashing on each pitch, while the gutter flashing extends up over the roof some 3 feet before it reaches the shingles. This method, though ugly, is effective where snow is plentiful and where heat is not excessive enough to cause much expansion. Shrinkage and expansion are the great drawbacks to long flashings; they are apt to pull the metal out of shape, causing bad leaks. Were it not for the fact that the ordinary gutter flashing extending under the shingles were punched full of holes in the nailing on of the roof covering, this last exposed method would not be made necessary.

Entrance motive to house at Philadelphia, Pa. Walter F. Price, architect. A good combination of stone, plain rough-cast and half-timber work. The carving is delightfully crisp and simple

The second method consists in using short pieces instead of long, which overlap each other, unsoldered. This allows for contraction and expansion, and, for the average climate of this country, is a better method. In reality this flashing is a flexible shingle, laid in courses to conform with the roof covering. It is ordinarily, for valleys and hips, cut in a keystone form, so that when in place the outside edges are perpendicular to the eaves and ridges, and they should be fully 18 inches long and 10 wide at the bottom or narrow part.

Valleys are either open or closed. The open type is most common, and is in reality an open drain. It should be wider at the bottom than at the top, so as to induce the descent and loosening of snow lodged in it. The close type shows only the slight ends of the flashing, the shingles extending fully into the angle.

We have already shown how the lower portion of the roof can be treated to prevent snow leakage and at the same time avoid the ugly exposed flashing half way up the roof. In a similar manner, the valley may be treated. It requires simply a wide drain under the valley, the details of which are easily figured out. Some arrangement of this sort with the close valley will serve as a most excellent safeguard against snow leakage.

Either of these forms of flashing, already described, can be used to flash about dormers, the problem being similar to that of the valley.

It is advisable to flash under the last course of shingles on either side of the ridge, and this flashing should be in one piece bent over in the form of the ridge or "saddle" board which surmounts the finished job.

Stepped flashing is used for joints between the incline of the roof and a vertical wall of brick or stone, i. e., on sides of chimneys and gables that project above the roof. The common method is to use small pieces of metal of such shape and size as to conform with the shingle courses. The exposed vertical edges, which overlap the piece below it, are set so as to space one or two shingle courses. The tops are bent over and let into the horizontal masonry joints at least 6 inches from the roof. These top joints should be built into the chimney or other wall as it is constructed, and not forced in from the outside afterward. It is also best that they be carried into the wall far enough to turn down over the outside brick course. This makes it impossible for it to slip out. The loose ends are adjusted to the shingle course afterward.

Servants' quarters of house, at Newburgh, N. Y., showing a good piazza and steps; also a telling use of the long shingle effect

A better way than this general method is to cut the flashings in a rectangular form, the exposed edge on the chimney being set at an angle so that its continuation when bent upon the roof shall be horizontal or in line with the shingle courses. This makes a better overlapping joint, the tendency of which is to shed rather than invite water, as is the case with the vertical overlap (see Fig. 7). The tops of the flashings can be turned into the wall as already described.

The lower side of the chimney is flashed with a lead "apron," which extends in one piece horizontally over the roof shingles, up one or two courses on the chimney and into the horizontal joints. The upper side of the chimney should be provided with a "cricket" or miniature roof, which serves to

Portion of house at Bryn Mawr, Pa. Wm. L. Price, architect. A creditable handling of stone and stucco as influenced by French and English half-timber examples

throw the water on either side of it and avoids the ugly snow pocket otherwise formed in the straight intersection. If the chimney be but one flue wide a much lower "cricket" will suffice than if the chimney be wider.

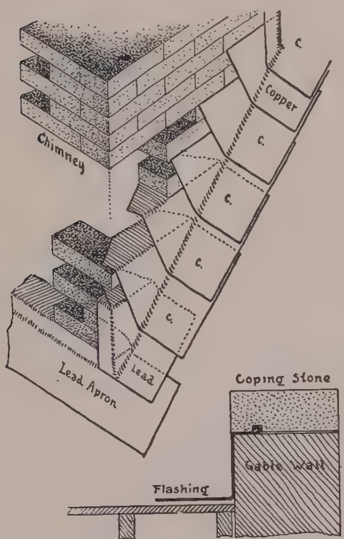


Fig. 7. Portion of chimney and section through stone coping, showing the flashing of each

If the walls of a gable end project enough above the roof, the stepped flashing can be used; if not, the flashing must extend to the stone. The common and worse way to do this job is to use long flashings, the wall edges of which are turned and forced into a "raggle" or groove cut in the face of the coping stone. Expansion and contraction soon loosen and destroy the efficiency of this method. Instead, the groove should be cut into the under side of the coping stone about 3 inches from the back face. The flashing, which should be of the short, rectangular sort, is carried between the wall and the coping and turned up into this groove, thus holding it fast (see Fig. 7).

If the space between the copper and stone be coated with elastic cement no water will get into the wall, from that side at least. If this flashing is found to interfere with the setting of coping anchors, the grove can be cut nearer the roof side of the wall.

Ordinarily copper flashing should be used, never zinc. In cases where it has to be modelled around joints consisting of more than two planes or the inequalities of rough stonework, lead should be used. Its malleable qualities are excellent, and with care that it be not punctured close joints can be obtained.

Outside finish, when it is intended to be painted, is usually of clear pine. Before putting any piece of finish in place the wall behind it should be covered with a thickness of heavy sheathing paper, which shall project 3 inches beyond it, so as to break joints with the other paper when laid. It makes a better and more lasting job if the back of all finish be painted before being set in place.

The water table, of whatever design, should be flashed with lead or zinc at the joint between it and the wall covering; the flashing to extend under covering at least 4 inches. The lower member, which projects over the underpinning, should have a drip, i. e., the edge should be bevelled so that the water will not run back into the wall.

Corner boards should be slightly reduced on the back to within 1 inch of either edge, so that any curling of that member shall not open the joint between it and the wall covering. In this case the board is nailed at the edges only. The ordinary flashing for such work is a 4-inch strip of zinc laid 2 inches under the finish. The exposed portion is covered by the wall covering, and thus makes a satisfactory piece of work. It is still better to use lead flashing turned into the angle and tacked to the edge of the finish.

Belt courses (generally used to separate two different kinds of wall finish) run horizontally, and follow the general rule of the water table as to flashing.

The bottom edge which overlaps the wall covering below should, as in the case with the frieze of the cornice, be either rabbeted or furred out to overlap it. Where the lower wall is of brick or stone the belt course becomes practically a water table, and should be constructed as such.

Window and door casings are flashed, as are the corner boards, except the head, which should always have an apron of lead or copper turned into the angle and well tacked to the top, after the manner of the water-table flashing. When the outside casing is flush with the boarding, the side flashing should be treated in the same manner as the head.

All outside finish should project far enough from the face of the wall to show fully one-half inch beyond the extreme projection of the wall covering.

All wall covering requires a thickness of heavy sheathing paper stretched on the rough boarding before it is laid. Paper should be laid horizontally, each width overlapping the one below it 3 inches, and be secured by nailing through tin washers. These widths of paper are laid as the sheathing progresses so that it shall not get damp and swell, as would be the case if it were all done at once.

Wall shingles, according to lengths, can be laid with various exposures to the weather. It is not wise that the weatherage exceed one-third the length of the shingle. Michigan pine shingles, which come as long as 20 inches, can be laid nearly 7 inches to the weather; thus the effect of the old Colonial shingle is easily obtained. This same effect, practically, can be gotten by laying the courses in pairs with an 8-inch weatherage and ½-inch between each course of shingles in the pair. If three courses are laid together in this way and then one plain course between the courses of three, it is possible to get the effect of from 12 to 15 inches weatherage, as the single course counts but little by contrast.

Showing differences in the wearing qualities between the hand-shaved pine and the sawed cedar shingles. The former, which is 18 ½ inches long, has done duty for 125 years, the latter for 15 years

In laying the first course of shingles on either wall or roof, the butts are cut about 3 inches; the second course is laid over this, with the butts even. With the third course the spacing begins.

Shingles laid next to upright finish should be nailed on the finish edge only, so that they will not shrink at that joint, which should be fairly close when laid. The two shingles coming in the first course over a casing should break joints with the upright edges, rather than be laid in line with them.

Recently there have been considerable redwood shingles in the market. They are beautiful in colour and texture, and so far reports are in their favour. As their grain has a tendency to coarseness, their wearing qualities are very naturally questionable and are yet to be determined.

Clapboards come in varying lengths, according to the section of the country. They are of pine, laid from the top downward, nailed to every stud, and the nails set for puttying as in the finish. The ends should be closely and evenly fitted together, so as to show as little joint as possible. The usual weatherage is $4\frac{1}{2}$ inches; more is unsafe on account of the small lap; less is apt to split the clapboards as the grain runs lengthwise.

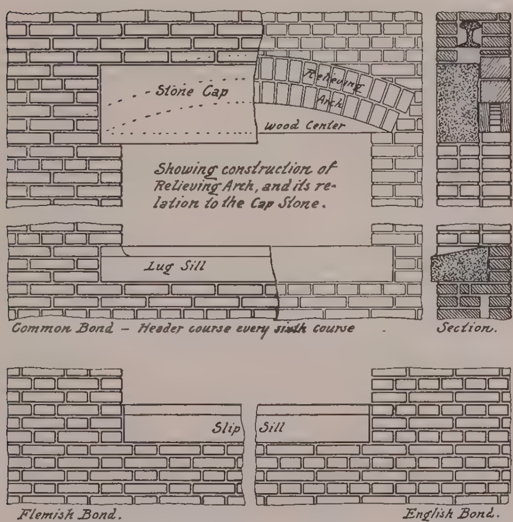


Fig. 8. The square window. Stone cap and sills showing various kinds of brick work

Siding comes in long lengths and is laid like the clapboard, only that it is rabbeted together. It is sometimes laid on the studs without boarding; such a method is not advisable for the best work, while it may answer for the summer cottage. Some very good effects can be gotten by the use of siding; a moulded edge is often used with excellent results.

Stucco, so far as the general results show, is not a wall covering particularly suited to our colder climate. It has been used in many instances, however, in New England and the North Atlantic states, with good results. Its great tendency is to crack and fall off, and the discreet builder will avoid it on general principles, unless it be for a fairly warm climate. If one is desirous of using it in the North, and can find an example handy which has stood the test, and get one's job done by the same workman, his chances of a decent wall are good. The great trouble is to get this work done carefully and properly.

While differing slightly in the method of application, yet that laid in the usual way, on wire lathing and furring strips affixed to the boarding, is as good as any. The furrings should be frequent, and of a triangular shape, with the lathing affixed to the apex of the triangle, so that none of the clinch of the plaster shall be lost. The sheathing paper used on rough boarding, in this connection, should be waterproof and well lapped, and nailed with galvanised-iron nails through tin washers. The nailings should be more numerous than in the case of contact sheathing.

Common bricks for wall facing should be of even tone, regular, and not too light in colour. Light bricks crumble and break easily when struck one against the other; such should be rejected. Even good bricks vary in colour, according to their distance from the fire in burning, and the usual method is to sort over the lot and "cull" them according to shade. They are then laid in the wall, grading from light at the bottom to dark at the top.

The common brick measures nearly 8 inches in length, 4 in width and 2 in thickness. The old English brick was much larger, and the various face brick made to-day are of various sizes, being often long and thin.

The common method of laying the facing brick is in courses of stretchers, with a course of headers every sixth course. This makes a good wall, both in appearance and stability. "Flemish bond" is laid of alternate headers and stretchers in each course; "English bond" consists of alternate courses of headers and stretchers (see Fig. 8). Both these last make as strong a job as can be built, there being little choice between them. Flemish bond is generally preferred for effect, and was largely used in the Southern Colonial architecture. It is not advisable to lay any sort of masonry in freezing weather. Bricks are ordinarily laid wet; in freezing weather, however, they should be laid dry.

The most common method of supporting the masonry over a door or window opening is by the stone cap or lintel. Although it has the appearance of carrying the load above single-handed, yet it is reinforced at the back by a relieving arch, which takes the load and prevents the stone from breaking. This arch, segmental in form, is turned on wood centres, and consists ordinarily of two courses of brick set on edge with close joints (see Fig. 8). The wall being bonded together above it, is thus supported, while the capstone is relieved of the strain. If an extra heavy weight comes over the opening the depth of the arch is increased, and frequently a piece of railroad iron is inserted over the cap to relieve this latter member directly.

Floor timbers coming above an opening are sometimes supported on iron beams set in the wall above the arch, or by framing a header into the timbers on either side of the opening for the support of those in the interval between.

Where an arch is substituted for the cap, the relieving arch usually takes its form, being above it correspondingly as the rabbet made in the vertical jambs for the insertion of the window frames. In such cases the centres are removed after the arch is set. Should the arch be near the corner or end of the wall, or be of such form, or be loaded so as to exert a considerable thrust or spreading pressure upon the two piers from which it springs, a tie iron should be built into the wall and securely anchored in either pier, to counteract such pressure. If the arch be fairly high, this iron may extend across the opening at the height of the spring; if

Entrance to "Belle Aire," Maryland, showing the effective use of Flemish bond as laid in two shades of brick

low, it can be inserted above the arch. The spring of the arch is its point of beginning on the piers.

Stone sills are either "lug" or "slip" sills. The former is built into the wall at either end, the built-in portions being called the "lugs." The slip sill, having no

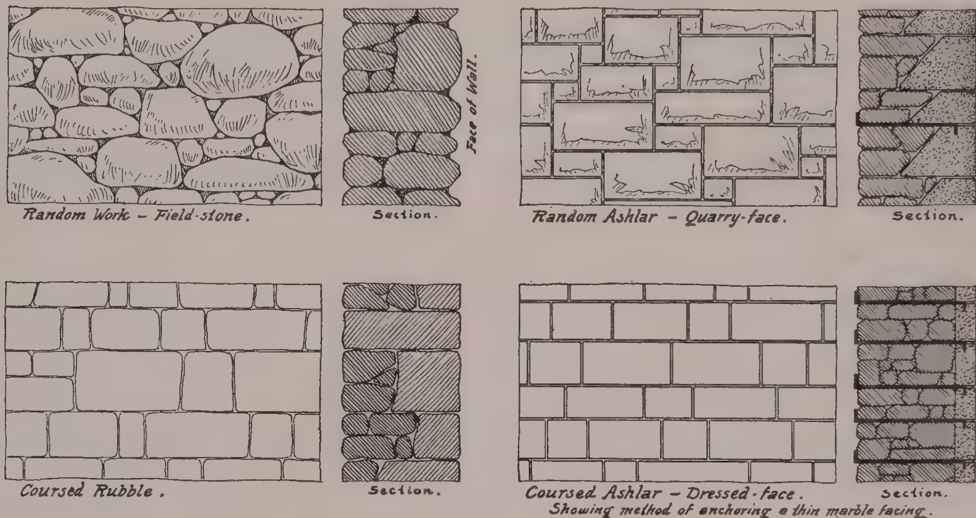


Fig. 9. Several types of stone wall

lugs, is only as long as the width of the opening, and is slipped into place after the opening is finished. This sill is generally used for basement windows where no other brick walls exist.

Care should be taken that the course of brick under the lug sill be not inserted until after the wall has settled and the mortar is thoroughly dry and hard, otherwise the sill is apt to be broken. If this course be laid up solidly at first, the settlement of the walls at the side of the opening, which is greater than the portion under the sill owing to the unequal distribution of weight, is very apt to force the lugs down while the central portion remains practically normal. The result is obvious. Sometimes it is merely the mortar joints between the sill and brick work that is omitted; while this is effective, the other method is perhaps safer.

Although the stone facing is subject to a variety of forms and treatment, we shall consider only those commonly used in the country house (for illustrations see Fig. 9).

Random work is composed of stone of various sizes and shapes, laid with an eye only to good bondage and effect, and regardless of courses. Its face may be irregular and rounding, as in field stones; or more even, as in the case of slate. The joints should be well filled with mortar and "weathered," or pitched, so that water shall not enter the wall.

Stones used in rubble work are approximately rectangular. They may be laid "random," without reference to courses, or in courses of varying heights.

The stones used in ashlar are cut in rectangular shape and the outside edges,

regardless of the face, made straight and true, so that the finished mortar joints shall come in one vertical plane.

Random ashlar consists of blocks of varying size laid without regard to courses. The best results are obtained in limiting any continuous horizontal run of joints to 6 feet; less than this is better.

Where the stone used is not so expensive as to be a mere shell, a most effective joint is obtained by making the back wedge-shaped, so as to tie in with the rough wall (see Fig. 9). This wedge should not be pointed enough to break off.

Coursed ashlar explains itself; the courses may be of the same height or not, and the stones of uniform or varying sizes. For the most severe styles uniform stones and courses are generally used.

Ashlar has either a rough or "quarry" face, or a "dressed" face. Owing to the fact that ashlar does not extend through the wall so as to bond the whole together, it is secured to the backing by means of anchor irons. Four-inch ashlar should have an anchor in every stone; thicker ashlar should be anchored about once in every running 3 feet and every 2 feet in height. Belt courses, cornice stones and top courses should have an anchor in each stone, and in extreme cases two.

Coping stones on gables should be anchored securely to the wall to prevent their sliding. The kneelers or corbels which receive the thrust can take care of themselves, but hardly more. It is best that they be anchored too. Sometimes an intermediary stone is introduced in the pitch to lessen the weight of the coping thrust. This is effective, and oftentimes a most artistic arrangement (see "b," Fig. 10). This, however, is not absolutely necessary as the anchoring will be sufficient.

The junction of the piazza with the house should in all cases be made tight and solid and be well flashed to avoid leakage.

The foundation of piazzas should be brick or stone, carried well below frost, and of sufficient bulk to avoid any chance of settlement. Nothing looks worse than the settled piazza, which has the appearance of being ready to slide off into the ground. This is a common fault, due largely to the insufficient size of the pier footings.

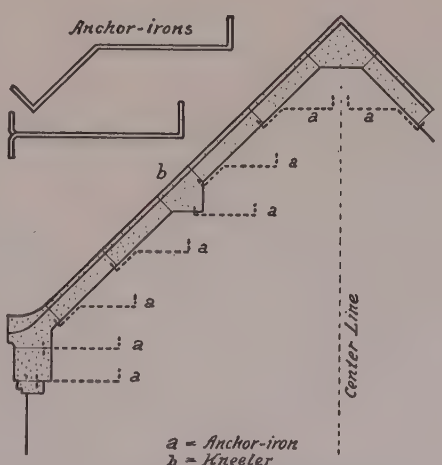


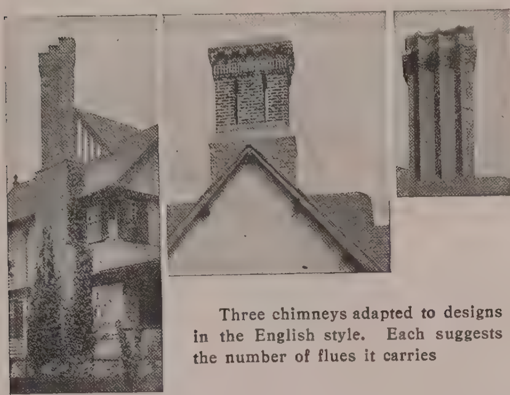
Fig. 10. A portion of a brick or stone gable showing the anchoring of coping stones

The piazza floor should be of matched $1\frac{1}{4}$ Georgia pine, blind nailed. It should pitch outward $\frac{1}{4}$ inch to the foot and be laid in the direction of the pitch, with ample facilities for free drainage.

The sills should be painted all over with a generous priming coat before being enclosed. This and a coat of tar on the top edge will preserve the member from premature decay. The butts are particularly susceptible, owing to their porous nature.

The foot of all columns should be tarred or set in elastic cement.

Up to 8 inches or so in diameter they can be turned from a solid stick. If in excess of this, the made-up hollow column is preferable, owing to the invariable tendency of large, solid sticks to "check" or crack. There are several patent made-up columns on the market which are worth considering.



Three chimneys adapted to designs in the English style. Each suggests the number of flues it carries

All steps, whether of stone or wood, should have a slight pitch, to effect the shedding of water. If of wood they should be of the best Georgia pine, $2\frac{1}{2}$ inches wide by $1\frac{1}{4}$ thick, laid with open joints. A step made up of $2 \times 1\frac{1}{4}$ inches, set edgewise, furred $\frac{1}{4}$ inch apart at intervals of 1 foot and bolted together through each furring, makes a better, though more expensive, job.

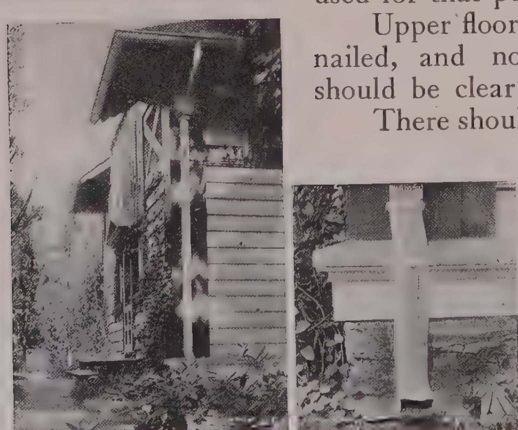
Stone steps are preferable to wood. Even in a flight of wooden steps the lower one should be of stone. Granite is perhaps the best stone to use, unless there be other and different stone in the house which it is advisable to duplicate.

Interior Details

Wooden bases are set prior to laying the upper floor. In this way any shrinkage at the bottom is not noticeable, and the upper floor, butting against it, can easily be taken up and replaced. In the best classes of work a small quarter round is inserted into the angle between base and flooring, so that the floor may be more easily swept. With a tile floor, tile or marble bases are preferable to wood.

Ordinary upper floors are best of Southern pine, i. e., hard pine from which the pitch has been extracted. Floors that are to be exposed are better of rift Georgia pine. More expensive floors can be laid in any of the hard woods used for that purpose, such as oak or maple.

Upper floors should be laid of matched stock, blind nailed, and not exceeding 3 inches in width. They should be clear stock, free from knots, sap and shakes. There should be one thickness of building or asbestos paper between the rough and top flooring. This serves to some extent as a deafening, and in the case of the asbestos, as a fireproofing.



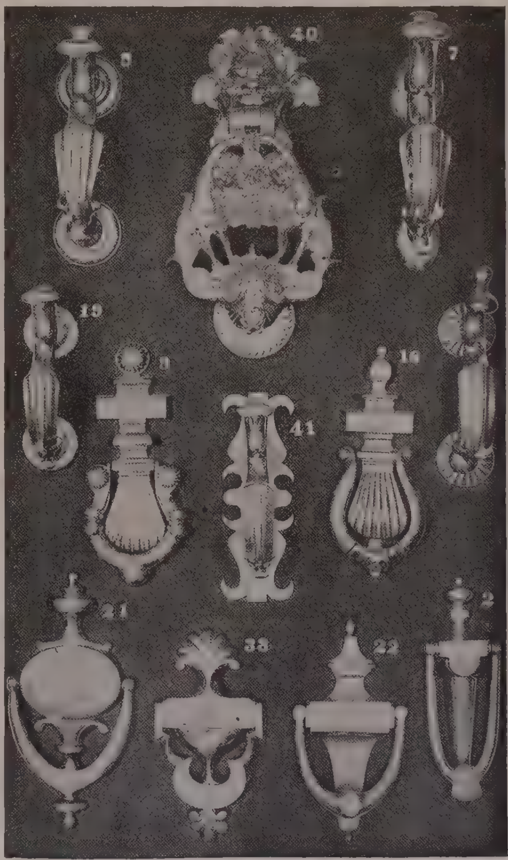
Showing an open cornice, leader, moulded siding and water-table, all of good design

Parquet floors are usually laid by the people who manufacture them. These specialists understand their business better than the ordinary carpenter, and a superior job is the result.

To prevent sound from travelling through a floor it is best that a concrete,

composed of cement, sand and screened cinders, be laid below the flooring. To effect this shoulder strips are nailed to the sides of the floor timbers, 3 inches from the top, on which short half-inch boards are nailed, or it may be possible to use up short pieces of seven-eighths stock. The concrete is laid on this to a level with the under side of the flooring. For a cheaper method deafening felt, used in two or three thicknesses between the floors, is fairly effective, and is most generally employed for this purpose owing to its inexpensiveness.

Tile, where laid upon wooden supports, should be treated in the following manner: One-inch rough flooring is laid on strong cleats affixed to the inside of the floor timbers, after the manner of the concrete floor deafening. On this is laid one course of brick set edgewise. The tiles are then laid in a cement bed on top. The depth of the rough supporting floor below the top of the floor timbers is governed entirely by the sum total thickness of brick, cement and tile, which latter is on a level with other floors.



Page from modern hardware catalogue showing the revival of old Colonial patterns in door knockers

Where cornices are used in connection with the plaster walls, they should be of stucco. They are "run" before the finish coat of plastering is applied. The angles between the walls and the ceiling are filled out and made as rough as possible, that the cornice shall adhere firmly when put up.

Where panelled wainscoting, walls or ceilings are to be used, their general construction should be the same as that of doors (see chapter on doors). It is put in in sections, each section being made and fitted at the factory. They should not be constructed until the rough walls are in place, as these are apt to vary slightly from these scale calculations, and the mere fraction of an inch makes considerable difference in such work. It is customary to measure the rough wall when completed and send these careful figures to the maker or, better, let him make his own measurements.

Picture mouldings should be well nailed to the studding, and should be set on a line with some member; or, if independent, so placed as not to conflict with other members. There is no sense in running them close on top of the window casings; if that is about the desired height, they should butt against that member, carrying out the line of the cap or upper member.

Painting and Hardware

Outside woodwork is "primed" as soon as possible after it is set. This prevents warping and several other undesirable things. The nail holes are then puttied up prior to laying the second coat. Knots and sap streaks should be shellaced. Two coats are enough at first; the third coat only serves to conceal bad workmanship. Furthermore, if a year be allowed to elapse the finish will have a chance to shrink, and then it can be puttied up, if necessary, before the third coat is laid.

Old music gallery at Alexandria, Va., and interior capital from "Brandon," Virginia.

It is customary to paint from the roof down, so that the finished work shall not be spattered. Body and trim, even if of different colour, are carried along together from one hanging of the staging.

Exposed exterior tin or galvanised iron should have two coats of metallic paint, to protect it as much as possible from rust.

Inside woodwork should receive one coat of oil to prevent putty from falling out; otherwise it should receive the same treatment as the exterior, two coats usually being applied.

All paint used should be of the best, and is generally specified as "lead, ground in oil."

There are several good prepared stains on the market, which save mixing. Cresote stains, though excellent for exterior work, are apt to retain their odour too long for the interior.

All shingle roofs should be stained. In this process "dipping" should be insisted upon, i. e., the shingle is dipped into a vessel of stain so as to cover two-thirds of it from the butt up. In this way only is the staining effective. If painted on, the natural shrinkage soon leaves uncovered places exposed, and it is these small channels that receive most of the wear and

which it is most important to protect. Wall shingles should be treated in the same way.

Inside stain should be applied before puttying and the putty be coloured to match it. This stain should be wiped with an old cloth, so that no surplus may collect and give a painty effect to the finish. Outside finish, if stained, should be treated in like manner.

Stained and hardwood finish usually receive an application of wood filler, two coats of shellac or varnish, each of which is rubbed down to a dull finish with pumice and water. Floors may have an application of linseed oil, and are finished with hard wax, well rubbed in.

The above treatments vary slightly in different localities and according to different authorities.

All exterior woodwork, if it is to have a natural finish, should receive a coat of wood filler and one or two coats of spar varnish. It should be re-varnished every year.

Much could be said of hardware that would be superfluous, and much advice given that would not be followed, since these matters must be decided by individual taste.

Briefly, all hardware should be good in design, and simple and effective in its working. The leaning toward simplicity is advisable, because it lessens the care, if for no other reason.

There are many manufacturers who are turning out excellent designs, both new ones and reproductions of old work. Their catalogues are full of good suggestions.

As to material, brass comes easily first. It requires some attention however, and yet for front-door fittings nothing could be better. Bronze is effective, and, in several ways, superior to brass; it takes care of itself, and requires little attention. Glass knobs are made in many interesting and novel forms, many of which are excellent. Care should be taken, however, to select such patterns as are not likely to come out of their setting; a knob in the hand is hardly worth two in the door. For cheaper work, some patterns of the porcelain knob are satisfactory.

In late years the old-fashioned knocker has received a new lease of life, and some very good reproductions are being manufactured from which to select. Bell pulls may get out of order and batteries run dry, but the door knocker can generally be relied upon.

All door hinges should be of the "loose-joint" pattern, which permits the door to be lifted from its hangings. In heavy doors the "loose-pin" butt is better than the "loose-joint." The pin can be drawn out at the top, making its manipulation in unhanging easier than with the other pattern.

It is best not to include the cost of hardware in the general contract. Far better that the owner select the hardware in the presence of the contractor and pay for it himself. The contractor under these circumstances can give considerable advice. The hardware thus purchased can then be set by him as a part of his contract.

When the hardware is thus furnished, the contractor should formally notify the owner, at least two weeks in advance of the time it is required, so as to allow for any reasonable delay in filling the order.

Old Dutch door and side seats. The Bowne House, Flushing, Long Island, N. Y.

CHAPTER V

Doors and Doorways

THE origin of the true door is not known, nor is the inquiry of great importance. With the Greeks the doorway signified a "passage of air," which is as good a definition as we of the present day can give it. The intervening centuries of much cheerful experience with the door have tended to confirm rather than cancel this signification. An open doorway will allow of the free passage of more air than of people in a given time; therefore the air should stand godfather to the door. That the Greeks appreciated this fact is quite evident, and testifies to their keenness of perception.

Like all other essential parts of the house, the door must have sprung from necessity. The cave man rolled stones to the mouth of his cave to protect his household from the dreaded invasion of animals. Later, man built habitations, perhaps first in trees, as an experiment, and to be safer from the prowling menace. With these first habitations the door may well have begun. Mr. A. B. C., tired of draughts and of acting as a windbreak to the rest of the family, became indignant, went out, slew a beast and hung its skin up over his rathole of a doorway. He had made a door.

Skins were probably a very long time in use, being much more serviceable even than woven stuffs, which were not introduced until a much later period. Even in feudal times, when the outer door had grown formidable in size and

strength, the inner doorways were closed by means of heavy hangings, a custom still popular.

The antique door was pivoted in the centre and revolved. The door of Roman antiquity was frequently of bronze, especially in public buildings. The doors of the Middle Ages were usually of solid oak planking, set edge to edge and dowelled, the whole held together with wrought-iron bands and more or less ornamental strap hinges. A modification of this form is often used at the present time. Frequently, too, these doors were studded with nails, having huge heads, driven through from the outside and clinched on the inside. The hinges were held in place by the same means. The doors of older castles were made narrow, so as to allow the passage of only one person at a time. This gave the occupants a decided advantage in the defence of the stronghold. The portcullis, which was really a door, or gate, sliding vertically, was usually made of sufficient width for two horsemen to pass abreast.

In the time of Christ we read that the angel rolled the stone away from the entrance to the tomb. This at first seems quite a task, and gives it a decided tinge of the supernatural, but when we consider that the stone was round like a cheese-box and rolled in a groove cut into the rock, the task seems less difficult.

Old doorway in Washington Street, Boston, Mass. This example is somewhat marred by the more recent door and the ugly bay set foolishly on top of the hood.

The panelled door is of comparatively recent origin, dating back only to the sixteenth century. It was, naturally, in Italy that the door was first treated as a serious architectural problem. We find many fine examples of fifteenth-century Italian in which architraves, or casings, of harmoniously coloured marbles were used. Some were severely simple, with perhaps the introduction of plain marble disks at intervals in the panelling, with simple friezes and caps. Others, much more elaborate, contained carved medallions, and friezes and caps of a corresponding richness. The doors themselves were, in the better examples, inlaid. Some of these are most beautiful in line and colour.

At a later date, with the revival of the classic, the architrave took on the form of the column and cap supporting the characteristic pediment. The pediment thus took the place of the "over-door," and was frequently very elaborate. Sometimes the over-door effect was painted on the flat wall surface, especially in the case of very high studded rooms.

The "over-door" was a feature used in most of the early examples, even up to about a century ago. It consisted of various devices intended to connect the door with the ceiling. Sometimes this took the form of the pediment; sometimes columns running to the cornice enclosed elaborate panels over the door; and sometimes, too, a window or transom light took the place of the panel. These motives combined with the window motives in giving apparent support to the cornice of the room.

The past century introduced low doors, which were sometimes pleasing and more often not. The great trouble is that the low doorway is simply a hole in the wall, without any architectual connection with the lines of the room. Of course it would be unwise to emphasise too strongly a door which, like a closet door, was unimportant and yet had to exist.

Doorway of old Custom-house, Portsmouth, N. H. This fine example has a touch of the Gothic in the entablature. It is perhaps a little light in composition with brick.

Raphael largely influenced the Italian style of his time and, in fact, of the present day. Marquetry was abandoned, and doors, now panelled, were painted. This painting was much influenced by the work of the classic fresco painters.

While Italy embraced the classic tradition and made free use of it in her doors and doorways, she made little use of wood carving. The French, on the other hand, generally avoided the severe lines of the orders and adopted carving to a great extent. The Italian style was severely architectural, while that of the French was more free and buoyant. Thus the temperament of a people finds expression in its art. Architraves were usually of wood, often richly carved—an entablature supported by wooden brackets—and the overdoor motive was sometimes a painting, a painting and stucco combined, or a bas-relief and carving. During the earlier Gothic period France created, in this style, some delightful specimens of design and wood carving, vying with the Germans in this respect. Gothic being particularly the style of the carver, great variety of design and conception was the result.

In the time of Louis XIV. much painting was used, and frequently combined with carving in a very pleasing way. During this period, too, locks and hinges became an important factor of the design, a revival of the mediæval idea. Marvellous creations in bronze and wrought iron were brought forth.

The influence of Gabriel tended to simplify the rather excessive outbursts of the later Louis XV. period; carving was very frequently omitted from the panelled door, and the more or less elaborate painting on a gold ground was introduced.

In the style of Louis XVI. a return of classic influence helped to temper the perhaps too free treatment of the previous reign. Beautiful details, sometimes flat and sometimes in relief, were controlled by an architectural basis of construction, which influenced and directed the main scheme of adornment.

With the Germans, those masters of wood carving, the earlier doors were very simple in character, and the doorways judiciously ornamented in the style of the Gothic. Carved panels of beautiful design and workmanship have come from their hands. Gothic carving reached its highest perfection in Germany during the fifteenth century. Oak was mostly used, and the earlier examples were very low in relief. Later examples, however, show such an increase in skill that

Door to Hammond House, Annapolis, Md. A fine example, both as regards proportion, scale and detail. The composition is good and the masses and colour well adjusted

the already growing boldness of relief was carried even into the round, in cases where this was possible.

German craftsmen evidently believed in paint, as many of these carvings were thus embellished. It is doubtful if such a treatment would add anything to the already beautiful texture of the oak, unless perhaps the colours were much diluted and used as a sort of stain. Even then they were better used sparingly, so as not to overbalance the natural textural beauty.

Some of the most charmingly individual examples of Gothic treatment are to be found in northern Tyrol, where the German influence is strong. It is wood architecture pure and simple, with a great freedom of artistic line and handling. Door posts, heavy and crude, run to the ceiling, and across the door head runs a shelf, with little or no projection beyond the posts. A carved panel surmounts this, and small bands of geometric carving enrich the edge of the post-like architrave. The door itself, with its flattened Tudor arch, is perhaps two panels in height, perfectly plain, and devoid of any moulding save for the chamfered edges of stiles and rails.

Doorway on the lines of the Renaissance, with an influence of the Elizabethan

Some examples have the upper corners of the door clipped, and are solid, with fine specimens of ornamental strap hinges and locks. The architraves are well-designed Gothic mouldings, which follow the outline of the door. Often, too, in the later works, where the wall is plastered above the wainscoting, the Gothic door head took on elaborate forms of wood carving, boldly relieved against the plastered wall. These are but a few of the many and varied treatments.

The English in their charming little half-timber houses usually treated the door in a very simple manner. Carving was only occasionally, and then sparingly, used on exterior door posts. The natural wood, which was generally oak, was counted upon for effect.

In the more elaborate edifices of the Elizabethan style, perhaps the most common form of exterior door was that of the Tudor Gothic. Its chief character-

istic was the low Gothic arch, the point of which was usually about one third of the span above the spring or starting point of the arch. It was usually solid, was hung on strap hinges, and frequently divided into simple or elaborate panels by strips nailed on the side opposite the hinges. The doorway itself had often simply moulded stone jambs, all within the line of the wall, while astride the arch, like a saddle, sat the usual label moulding of the English Gothic. Interior doors were commonly square headed, and were frequently treated in the manner of the wainscoting in which they came. This treatment served to conceal the door to a great extent.

Later the combination of classic and Gothic produced some highly interesting results, as well as many strikingly bad ones. The Classic pilaster supported a Classic entablature, in which were distrib-

Doorway in the Chase House, Annapolis, Md. A suggestive example of the Southern Colonial. The door is well studied in mass and detail

uted Classic and Gothic details. Sometimes the Gothic got in a telling stroke; then again you had to hunt for it. One striking feature is the terminal pilaster, in which the shaft of the motive tapers from the cap toward the base. Some good effects have been obtained with its use. In the carving very few planes were used, and the effect of the whole is rather toward the stiff and brutal, although it is often excellent, and, further, is strictly on the lines of wood carving.

An adaptation of the Japanese at Fall River, Mass. Cram, Wentworth & Goodhue, architects

At a later date the influence of the Italian predominated, but it lacked the grace and beauty of line which characterised its parent. This was the Georgian style. Sir Christopher Wren did much to raise this degraded style, and several examples of our own early work are attributed to him.

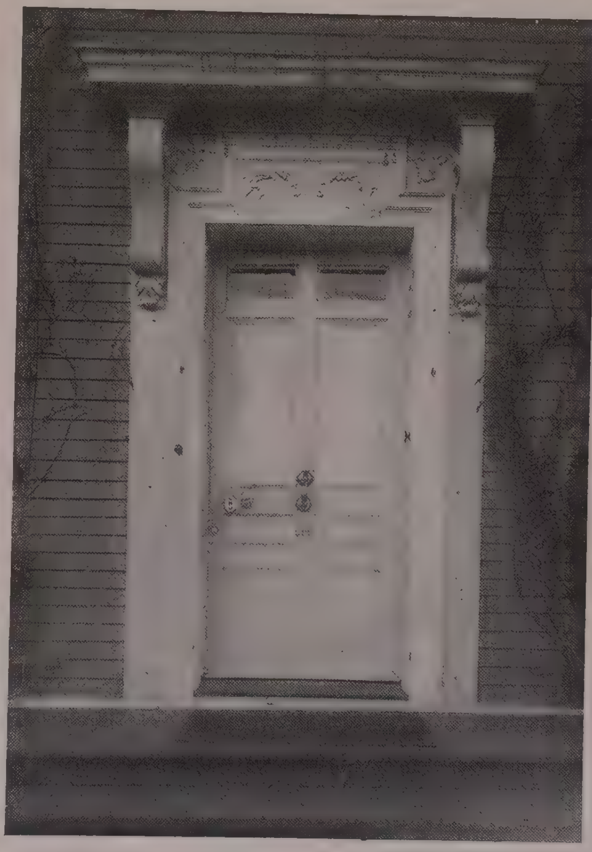
The term "Colonial" is somewhat misleading. It is really a copy of the Georgian, and is, in some instances, pure Georgian. But as the conditions of the colonies demanded greater simplicity, in their generally poorer condition and problems of life, they were led to invent, modify and devise motives which differed materially from the parent style. The Southern examples of Maryland and Virginia are perhaps nearer, in most instances, to the English models. On the other hand, many of the New England examples show novel though not always successful treatment. The earliest forms were of course very simple, hardly any attempt at design being made. Later developments were more pretentious, and in many instances suggestive of luxury.

The general basis of design being Classic, the results were more or less severely architectural, some examples adhering closely to Greek and Roman proportions. More, however, deviated in the Italian direction, and these were perhaps the most pleasing. The more successful of the free examples have a tendency to lightness of detail, and frequently introduce ornament of a Gothic character. Those leaning toward a heavy treatment are generally, unless purely Classic, clumsy and in bad taste. The principal legacy of the Dutch settlers was the Dutch door. It was brought with them from the fatherland, and seldom, if at all, penetrated either to the South or East, being confined to the vicinity of its introduction, principally in New York and Pennsylvania. This door, which was always exterior, was constructed in two halves, each swinging inde-

pendent of the other if desired. Thus the lower half could remain closed, while the upper was opened for light and air. Provision was made for bolting the two halves together so that the whole thing became an ordinary door. With this very handy form the children were kept in, and stray pigs and chickens out, while the door, to all intent and purpose, remained open.

Another Dutch notion was that of the seats flanking either side of the entrance. These were used with and without the porch motive. It was probably from this source that Rip Van Winkle first learned to "tarry"; hence, old Tarrytown should have been well supplied with this commodity.

The Colonial doorway took on many forms, which are best exemplified in the illustrations. An early form was that using the corner block, in which the architrave received into its corner intersections a square ornamental block. In wooden examples where the baseboard projected, and often when flush with the architrave, this last member was set on a plain base of sufficient projection to receive the baseboard. Another modern treatment was to enclose the whole with a back band and omit the base. From the nature of this construction, the architraves were made symmetrical. Later came the pilaster, surmounted by either the straight cap or the curved or segmental pediment or the straight or curved "broken" pediment. Sometimes the pilaster was abandoned as part of the design and the pediment, varying in form, was supported by brackets. Another form of door treatment was the Venetian door. This consisted of three divisions separated by two mullions, the larger opening of which formed the windows or side lights. An arch over the door constituted, with this triple arrangement, what is termed the "Palladian motive," and not infrequently the arch, made elliptical in form, spanned the three openings. This considerable area of glazing offered a chance for beautiful leaded glass. The door itself was usually simple in character, no carving being introduced except in the panel mouldings. Sometimes the montant was of extra width, beaded in the centre to suggest double doors. This was used only when the doorway was of extra width. Such treatment, however, is hardly to be



The old Longfellow doorway at Cambridge, Mass.

commended, as a door wide enough to look well thus treated would, under ordinary circumstances, be wide enough to be made openly a double door.

Those who may be tempted by the fascinating lines of the Japanese will do well to study the original models; for while these, in their existing form, are hardly practical if copied blindly, they nevertheless suggest great possibilities in adaptation. The style is marked for its bold and graceful lines and its elaborate carving contrasted with plain surfaces. The usual door is simple in its lower half, and has inserted in its upper half a carved and perforated panel of teak.

Street entrance to Royal House, Medford, Mass. This doorway is almost perfect. The proportions and mouldings are simple and good

Early outside doors in America were usually hung on strong, substantial, iron strap hinges, with box locks, and were further reinforced by a door bar of oak, which swung on a bolt from the hinge side of the door into a socket on the other side.

As has already been stated, very early doors, being hung on a pivot, revolved, and are termed pivot doors. The hinge superseded the pivot, and has been used in one form or another ever since. The box lock (which was attached to the outside of the lock rail) has continued in use on the Continent, but has been replaced in England and America by the mortise lock. The mortise lock was introduced into England toward the end of the eighteenth century.

A sash door is one which is glazed in the upper portion; it may or may not be a sliding sash.

A "jib" or "concealed door" is made flat with the wall, has no architrave and is intended to be unnoticed. It is used when it is necessary to preserve the symmetry of the room, as in a closet or other unimportant doors. These doors are hung on pivots instead of hinges in the manner of some of the early cabinets. They are now little used, as their chief auxiliaries, the secret passage and staircase, are things of the past.

Courtyard entrance to Royal House. This example is interesting from the point of its strong simplicity

The "swing door" is hung with double-action hinges, and, having no striking piece, swings freely both ways. Instead of the double action hinges a strip the width of the door and a couple of inches wide can be hung to the door frame in the ordinary way. The door in turn is hung to this strip, with the hinges on the opposite side from the first set. To this is added a coil spring for each set of hinges, in order that the door may remain shut when not in use. In the private house the swing door is commonly used as a means of communication between the kitchen and dining room; in this case the upper part should be glazed, so that the approach of persons can be readily detected from the other side. Ground or stained glass may be used, but it is advisable to have a certain amount

of plain glass which shall enable one to see clearly. If the house is large enough, and the service demands it, two separate doors should be provided, one to be used for entrance and the other for exit.

The "weather doors," used in winter to reinforce the outside door in keeping out storm and cold, are commonly batten doors of plain matched stuff, with a makeshift sash, perhaps, screwed against a hole in the upper half. That this is ugly and unnecessary goes without saying, and more especially if it forms the entrance to the "dog house" usually tacked about the front door. Here is a chance to use as close models some of the strongly simple examples of either the Middle Ages or the New England Colonial. Where there is no vestibule, the weather door and the outside door coming together are awkward to handle, resulting often in jammed fingers and other little pleasantries. A better plan is to have a vestibule and two well-separated doors. The inner outside door can be made more delicate in design than the outer, or weather door, which may be of the Dutch pattern. With this arrangement the inner door becomes practically an inside door, hence the reduction in scale of details is possible. In pleasant weather the outer door could remain open (or half of it if a Dutch door), and in the winter and stormy weather it could be closed. Another fault, where the two doors are together, is that the outer must of necessity swing out, and, while having some advantages in repelling the weather, is very apt to stick, and, when suddenly opened, upset some portly caller over backward and down the steps. One cannot expect one's friends to appreciate such treatment. The real objection to the swinging in of the outside door is that its construction allows for the accumulation of rain and snow in the doorway, which, becoming frozen, is a bother and hindrance in opening the door. An extended porch or piazza might prevent this to a certain extent, but in its absence there are those who may be willing to risk the bones of others and prefer that the door swing outward. This may be easily prevented by having enough glass in the upper panel to enable one to see who or what may be outside; side lights may answer the purpose, but they are less direct. A still better idea is to have a wrought-iron or bronze grating on the outside, and the glazing behind it in the form of a swinging or sliding sash. The pedlar who is wont to shove

Interior doorway at "Gunston Hall," Virginia. A good example of the straight, interrupted pediment. A bust is supposed to occupy the space at the top

his way into the house is thus taken care of, and even the persistent book agent is held at bay.

Door stops are too well known to need much description; they are generally of wood, and are screwed into the baseboard to prevent the door swinging against the wall. They are hardly ornamental, owing to the position in which they are placed, and thould be kept of the same colour as the baseboard. They are now frequently made of brass, but it does not seem that their importance should be emphasised by the use of this metal. They have, however, the advantage of being made in longer sizes, which may answer in special cases.


Interior doorway at "Whitehall," Maryland. A beautifully rich example of Colonial work

The "double door" consists of two doors hung from opposite jambs, swinging so as to engage each other in closing or opening the door. They are usually hung with loose joint butts, so that they can be removed if desired. One half is provided with a bolt top and bottom, which, set into the edge of the stile, engages the sockets set into the threshold and the top jamb. The other half carries the lock which engages the first half. This arrangement allows of the first half being bolted, while the second half can be used as a single door. A small moulding is affixed to the face of the inner style of the second half, projecting beyond the edge so as to break the vertical joint between both halves when closed.

About the time of the introduction of the mortise lock came the "sliding door." Its general appearance is that of the double door, only instead of swinging it slides into wall pockets on either side, thus being entirely out of the way. This treatment, of course, increases the thickness of the partition, which is constructed of two rows of studs set flatwise, so spaced that the finished partition would be about 9 inches from plastering to plastering. The inside of the pockets should be sheathed with ½-inch matched sheathing, as a protection against dust and draught. Stops should also be utilised to keep the doors from sliding too far back into the pockets. Early examples were let into a rabbet at the head and rolled on small brass tracks set on the floor. The best modern method hangs them from overhead tracks, which does away with the stumbling block on the floor. Often this small track is retained to steady the motive, and in modern work is but very little in the way. When closed they are fastened by an especially designed mortise lock which is operated by a sunken knob or other arrangement.

The sliding door has some advantages over the double swinging door. When open, it is out of the way entirely and does not occupy wall space, which is the case with the double swinging door. The modern room of moderate dimensions, in which the swinging doors are installed, loses practically the whole side as a satisfactory background, and the floor space within the radius of their swing is absolutely useless. Ordinarily, perhaps, the doors would not be often open. though this would depend largely on the frequency with which the occupants of the house entertain. But sliding doors have most important advantages : they permit of the circulation of fresh air without danger of banging. The closed swinging door is far less healthy, and is, moreover, an awkward thing at the best. When opened to its fullest extent, especially in a small room, it frequently infringes upon half the available wall space.

On the other hand, the swinging door is easier to keep closed, and is more truly architectural in all positions than is the sliding door. One finds its easy movement, in opening and closing, hardly retarding to one's passage when in a hurry, while the sliding door works more heavily and requires a special effort to open and close it. We have mentioned these things, not with the idea of forming a prejudice against either style, but to show the shortcomings of each, that the builder may choose between them in special cases. In the planning of a house, the swing of a door should be indicated on the plan to show its full latitude.

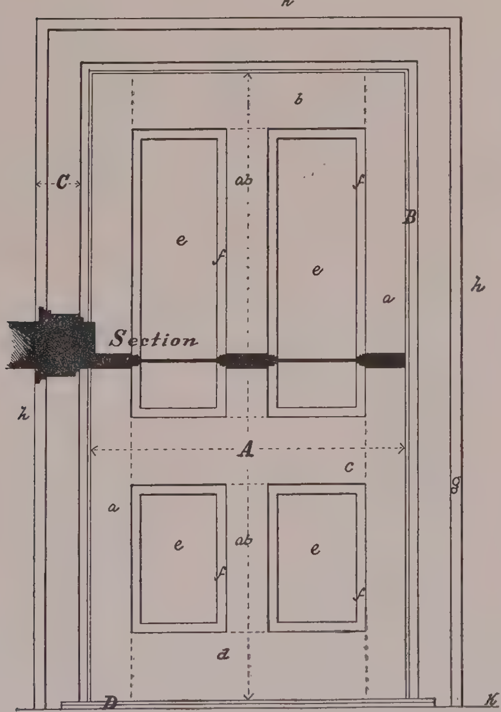


Fig. 11. Diagram showing parts of an ordinary panel-door

A. Door
B. Door frame
C. Casing or architrave
D. Threshold
a. Door styles
b. Top rail
c. Middle or lock rail
d. Bottom rail
e. Panel
f. Panel moulding
g. Back band
h. Wall
k. Floor line

The "batten door" is usually made of $\frac{7}{8}$ stock, tongued and grooved and secured by battens on one side; one at the top, one at the bottom and perhaps one in the middle, with a diagonal brace if necessary. These braces, or battens, are best secured by means of screws. They are used where any rough door is required, as inside cellar doors or bulkhead doors. In the latter case, care should be taken to give it a sufficient pitch to shed the water. Ordinarily they are hinged at the side and let into a rabbet on three jambs, which often allows rain and melting snow to freeze up the joints. This may not be, in some localities, a serious objection, yet it seems as if the accepted construction of the bulkhead door is far from perfect. About the only safeguard is to pitch the door as much as possible so that water will run off quickly and snow will be less liable to lodge.

It is always better, on account of weight, to build bulkhead doors in two halves, unless the width be fairly narrow. The joint between the two halves should be broken by a weather strip to exclude moisture.

A recent scheme, which is designed to do away with the bulkhead, places the cellar entrance under a flight of inside stairs, in such a way that the necessary head room is obtained to allow of the outer door being made a vertical or ordinary door. This places the steps on the inside of the cellar wall. The idea is excellent, but cannot always be adopted owing to the arrangement of the plan.

Doorway of Hammond House, Annapolis Md. This little gem is entirely pleasing and satisfactory

Another method is to enclose the outside cellar steps with a small house. This often may be most effective as to looks, as it surely is in convenience, but it usually has the appearance of a huge and ugly dog house, unless carefully handled.

Screen doors should not be of the usual stock pattern, as they will kill any design that was ever made. It is better to have the architect design them while he is doing the house. They then stand a chance of being harmonious. They should be light and simple, yet strong enough to prevent the children from falling through them.

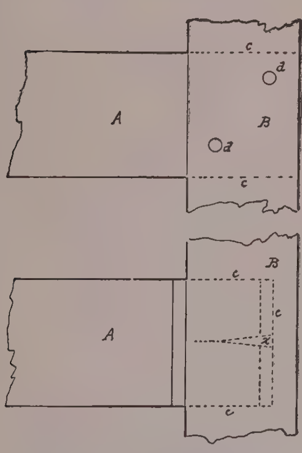


Fig. 12. Old and new methods of door construction
a. Rail b. Stile c. Mortise line d. Pins x. Wedge

The ordinary panel door is usually two panels high and two wide; this type is taken for convenience, only (see Fig. 11). Its flanking vertical members are called "stiles," and the central vertical member is called the "montant or centre stile." Often this member is omitted, as in the case of horizontal pannelling. The horizontal members are the "top rail," "middle" or "lock rail" and the "bottom rail." Early panel doors were put together by cutting mortises through the stiles and inserting the tenons cut in the ends of the rails (see Fig. 12). They were kept in place by wooden pins. Now as wood shrinks hardly at all in the direction of the grain, and considerably in other directions, it will be seen that the tenons and pins soon became much in evidence. This fact evidently

annoyed the finer senses of the public, or perhaps the door builder did some inventing to outdo competitors, which is more likely. However this may be, the better door of the present day has the mortise made so as not to run through the stile; and the tenon, split in the middle for the insertion of a wedge, is coated with glue and forced into place. It is readily seen (see Fig. 12) that this makes a most effective joint, and yet one almost, if not quite, regrets the pins, from an artistic standpoint, which show clearly its manner of construction.

Vestibule door at Alexandria, Va. An interesting treatment, but somewhat difficult to keep clean on top

The door is hung on hinges from the "frame," which in turn is nailed to the door studs on either side. The old method of treating the frame was to rabbet for the door; in later work a stop, or striking piece, was fastened to the inside, thus forming the rabbet. Of the two methods, each has an advantage. The stop admits of hanging the door on either side of the partition at will; but unless it is very well put on it is apt to gape open, thus leaving a crack through from one room to the other. The old form has not this disadvantage, but the door cannot be changed from one side of the casing to the other without a great amount of trouble; however, it is perhaps the better for serious work. Whichever method is employed, the frame is best made from 2-inch stock; closet doors can be made slightly lighter if desired.

In the beginning the plans should be well gone over, and the swing of every door determined. As their swing is usually marked on the plans, there should be no mistake. This should be most carefully thought out, not only with reference to convenience in opening and shutting but with a view as to what it is liable to strike or displace, in the way of furniture, pictures or other wall ornaments. It may be desirable to give the entering guest his first impression of a room in some particular direction, and the door should swing opposite to this to enforce its notice. All other things being equal, this can be taken advantage of, although never to the sacrifice of convenience. On general principles, doors should open inward, so that the guest is not obliged to step back in his natural passage from the open air to the hall, the hall to the reception room, the reception room to the living room, the living room to the dining room, and so on. He should be made to feel that his welcome was cordial rather than restrained. Chamber, bathroom and toilet should always open in. No door should open into a passage, other than a closet door, which always opens toward the outside. It is inadvisable to swing a door over a register or against a radiator; the veneered door might possibly stand it for a while, but it is tempting inevitable fate.

Doorway at "Whitehall," Maryland. This beautiful example is somewhat marred by the upper four panels of the door, which seem to be of later date and set in like a sash

Returning to the door structure: The frame is secured to the door studs on the inside of opening, and any deficiency between the frame and studs is furred in at the point of nailing. It is well to see that the door frame is placed in the centre between the stud opening or, better, the room, as, in case there be much play between them, any attempt to disregard this and nail one side of the door frame to the stud would result in a slight throwing off centre of the whole doorway. Ordinarily, perhaps, this might make little difference, but an over door of some designs is apt to be found noticeably out with ceiling decorations or panelling and the flanking wall motives of an academic or balanced plan. The architrave is adjusted by fastening one edge to the door frame and the other to the door stud. The back band is the outermost member, and is rabbetted to fit over the architrave, forming in design a part of it (see Fig. 13). From its character and position the back band adds strength and colour to the doorway, and relieves it of a certain flatness. Practically it receives the butting of the base and dado moulding.

Old doorway at Deerfield, Mass. A fine suggestion for modern Colonial work

Door panels, especially of soft wood, are apt to shrink considerably, and if hindered in shrinking will crack. It is therefore advisable in adjusting the panel mouldings that they should be nailed into the stile and rail rather than into the panelling, as in addition to cracking they are liable to pull away from the stile and leave ugly gaps in following the panel. As such springing is only possible in the centre of the panel, since the ends are held in place by the return moulding, it is readily seen that what is liable to happen to that panel is likely to be annoying enough. The nailing into the panel at its ends is less liable to be attended with evil results, but this should be done in the centre only, for obvious reasons. A vertical panel is termed a "standing panel"; a horizontal one, a "lying panel."

Fig. 13. Fine examples of Colonial architraves and door mouldings with raised panels

Thresholds or door sills are usually of $\frac{7}{8}$ stock, preferably of oak or maple, but selected close-grained hard pine makes the next best thing. They should be considered as regulating the swing of the door from the floor, and as such should be thick enough to keep the door

amply clear of rugs, mats, etc. Exterior door sills should be rabbeted on the tread or top to prevent rain and other moisture from entering the house. These door sills are best made from 2-inch stock.

Of the softer woods, clear white pine makes the best door. Whitewood doors are cheaper and frequently take stain well, but they should be avoided on account of the way in which they warp and twist. The ordinary door is usually of $1\frac{1}{2}$ to 2-inch stock. It is not advisable to make even closet doors less than the former. Some closets demand it, but a thin door is generally too thin for the mortise lock, and every door should have a lock of some kind. The solid hardwood door is not to be recommended on account of the high temperature of our houses; anything but a veneered door will warp. The solid door is also heavy. Sometimes hardwood doors are made of two thicknesses; this is not as good as the three-piece veneered type. It is better to make all doors, outside of pine, of the veneered type; those of the interior can be made with $\frac{1}{8}$-inch veneer on panels and $\frac{1}{4}$-inch on stiles and rails. The panel mouldings should be solid, while the jambs or edges should be of from $\frac{1}{2}$ to $\frac{7}{8}$-inch stock, all of which should be built upon a core or body of white pine. This is the three-piece door; a five-piece being constructed by the use of a double layer of veneer on each side, in which case the grains of the wood should run in opposition.

An interior doorway influenced by the style of Louis XV. and XVI.

The five-piece door is, of course, more expensive and naturally better, and is to be recommended for outside doors, where the heat on one side and the cold on the other are sure to do things with the most carefully planned of man's contrivances. If the core of the outside door be made of "staves" or strips glued together instead of the solid core, it is better. In the building of all veneered doors care should be taken to see that the panel moulding fully covers the joint between the veneer and the door (see Fig. 14). If this is not

done it suffers in looks, and in the case of the outside example exposes the joint to the tender mercies of the weather.

Transoms are sometimes used over doors for the purpose of ventilation. When used they should be large enough to pay for putting them in; the glass should not be less than 12 inches high. They are sometimes hung in the centre of the ends or at the bottom; in any event they are controlled by means of adjustable openers.

In the house of moderate cost, stock doors (for the interior) will save something in expense, but they ought not to be used as outside doors unless of exceptional construction, as the best of this sort is none too good or too well equipped to stand the test to which they are subjected. In suggesting the stock door, it is only with the idea that it may be used in the simple and less architectural efforts, and even then the architect should have a hand in their selection. Wherever possible the door should be designed especially for the place, as any creditable effort is likely to be utterly ruined by the introduction of a foreign motive.

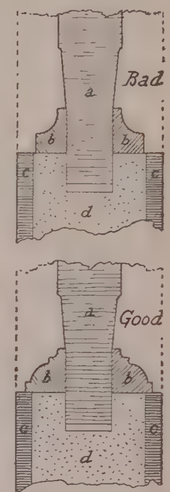


Fig. 14. The veneered door, showing good and bad construction
a. Panel
b. Moulding
c. Veneer
d. Door body

Doors are usually 2′ 10″ by 7′ 0″, but it is better that they be 3′ 0″ wide except in the case of the closet door, which may be narrower. Some authorities claim that when a doorway is over 3′ 6″ the door should be double. This seems to be hardly practical, as it requires both doors to be opened in order that the ordinary person may pass comfortably. If it is desirable to increase the ordinary opening to 3′ 6″ the single door will stand it. Sometimes the 4′ 0″ door is made to swing, but with a considerable strain on the hangings. Such door had better be slid, and if the swinging door is insisted upon the increase to 5′ 0″ is slight, and the double door may be used. The 3′ 6″ door, however, is the limit; it is the largest for swinging and the smallest for sliding doors. Wide doors can be slid, but an 8-foot opening ought not to be a common thoroughfare, unless, perhaps, the doors are to be kept generally open.

An unusual door hood at Newport, R. I.

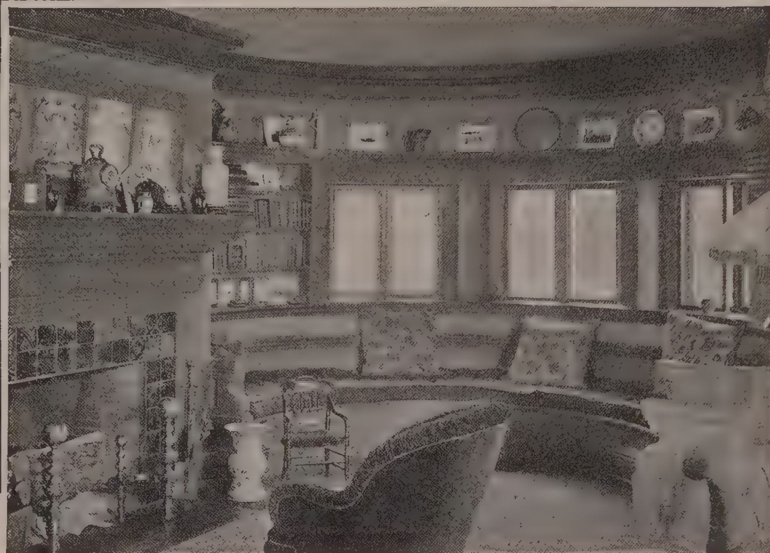
It would be impossible to lay down any fixed rules as regards the size of doors as elements of design. A 3′ 0″ by 7′ 0″ or 7′ 6″ door looks well if rightly treated. On general principles a doorway 6′ 0″ wide by 7′ 6″ high is easier of treatment than one where the opening is square or the width excedes the height. There is, perhaps, a tendency to go to extremes in

double-door openings. People who entertain about four times a year wish to knock out partitions in order that the house may be "open" to the guest. Under any circumstances there is a lack of privacy about this, which one is sorry to note as entirely "American."

A modern doorway at Arlington, Mass. It is based on the old example shown on opposite page

In the architectural treatment of doors and doorways, it ought always to be remembered that they are a very important part of the composition and should be made harmonious and tie in with the rest of the scheme. Important doors should be so emphasised as to be found when wanted, while closet doors and the like should be kept subservient to the rest of the general scheme. If two doors are placed in a wall in such a way as to balance one another, they would naturally be treated the same. If one of these leads to the parlour and the other to a closet, it is not good design. One does not care to waste one's sweetness on the depths of a closet when one is expecting to strike the hostess dumb with envy. It is better to keep the height of all doorways in one room the same, in which case closet doors may be panelled in the interval; the same use may be made of the transom. There should be some sort of studied relation between the height of the doors, windows and mantels. Sometimes, as in the English Gothic, the unimportant doors occurred in the wainscoting, being panelled in the same manner, and having no distinctive architrave or conspicuous hardware. This takes care of the problem very satisfactorily in one way, but the door should not be so entirely hidden that one must consult a plan of the house to tell where it is.

It is perhaps not putting it too strongly to say: *Never make a doorway without a door!* There may be exceptions, but there generally comes a time when it is desirable, if not absolutely imperative, that the opening be closed. This may be accomplished through the agency of the sliding door, which takes up no desirable space and yet is ready when called upon.



A modern treatment of the circular window bay. Andrews, Jaques & Rantoul, architects

CHAPTER VI

Windows and Window Motives

THE first windows were simply holes, and unglazed. They were naturally small, as those living in the open air did not require large ones. The windows in southern countries, too, required but small area, owing to the intensity of the light; the reverse is true in the more northerly localities. Classic Greece and the later Roman Empire used the window but sparingly. The prevalent form of ancient dwelling was built with a court in the centre; the windows opened upon this court. In the Pompeian dwelling the windows, located on the court side, were high from the ground and in a measure protected from the weather by the projection of the cornice.

Windows have followed the general outlines and peculiarities of the doorways, and with the use of glass were subdivided in many and varied forms. With the middle of the fourteenth century the square-headed form became common and, with the Gothic, very elaborately designed tracery was employed.

Glass was little used by the Romans, although its manufacture was known to the Egyptians about 2,000 years B. C., and perhaps much earlier. However, their climate hardly required it, and by them it was used in the form of vessels. Glass was first used in England, for the glazing of windows, about 1180. Stained glass is claimed to have existed as early as the year 1000, but nothing definite is known until the opening of the twelfth century.

Except for the Spanish in Florida and southern California, the French in Louisiana, the Dutch in New York and the Swedes in Delaware, the influence in the United States was that of the English down to the latter part of the nineteenth century. The forms of windows were generally simple, and as the English copied largely from the Italian revival, many of the better forms are from this source.

One of the first considerations in regard to windows is their location in the room. They must admit light and air; they must give a clear outlook, and yet not rob one of one's privacy. If your estate be small it is not well that your neighbour should be able to tell by casual observation (through an opera glass) whether the label on your smoked ham be that of Swift or another, or that the game piece on your dining-room wall be a genuine "Old Master" or a chromo. Hangings will do much, but it is not well that they should become an absolute necessity. Another thing, and an all-important one, is the relation of the window to the furniture. Piano backs do not look well from without, to say nothing of their effect from the inside. Chairs, sofas, sideboards, beds and the like should be provided for. If they are not considered, they have an awkward habit of getting under foot and of destroying what might have been otherwise a well-calculated lay-out. Some people have an idea that to pepper the windows in with arcade-like regularity means good lighting. Perhaps it does, but a home is not a public school. There is such a thing as too much light, all supposition to the contrary, and there is also danger in too little, which is, perhaps, after all, the greater evil.

French window motive in the influence of the Classic revival at Flushing, Long Island, N. Y. The stairs are of later date

There is much diverse opinion as to whether windows should be distributed or brought together in one motive. One argument in favour of the latter plan is that the light is more concentrated and that a more generous view is afforded if the windows of one side of the room at least be grouped. With this grouping, the wall space also becomes more massed and affords a better chance for the distribution of furniture. Of course there are places where the ordinary width of a single window can and should be used. The style of the edifice and the size of the rooms should govern this largely, but on general principles it seems better that the same amount of lighting surface were better in its concentration than distributed among several small windows.

It may often be found of advantage to use a short, high window, as over the piano or sideboard, but it should never be used above the dresser nor above the sofa or couch unless they be of a character which avoids the possibility of draught. The dresser should receive light from the side or rear. Even in the case of the sideboard or piano, it is better that the light should be toned down, so that it shall not shine too strongly into the eyes. The piano should always receive a stronger light from the side or rear. Stained glass or hangings can well be used to reduce the light.

Modern Colonial bays on Beacon Street, Boston, Mass. The estimated cost of the bays, constructed of best pine stock, are: Large bay $285; small bays, each, $50

The size of the window varies according to its location and requirements. The ordinary width is about 3 feet; in extreme cases only should it be less than 2 feet. The absolute dimensions are governed by the glass, which comes in sizes of 6, 8, 10 inches, and so up. It is better to keep the width of a single window within 5 feet; and especially where the sash is of the common sliding sort should the relation of the width to the height of the sash be carefully considered. If the sash is too wide in proportion it is apt to jam in raising or lowering; it is also heavy and hard to lift. Where a number of windows are grouped together in the mullioned form, as in the Elizabethan style, it is better that they should be narrower and more numerous, for the above reason. Sometimes the window motive consists of three windows together, the wider in the

House at Chestnut Hill, Mass., showing several different window motives well adapted to the style of the structure they embellish

centre with the narrower ones flanking it. In this case, provided that enough air can be gotten from the two side ones, the centre one can have a fixed sash, and consequently be wider than if it were to be opened. If the air is not sufficient from the two sides, the whole or part of the centre opening can be made a "French" window.

As regards the height of the window stool from the floor, there are several conditions which would govern this. The ordinary first-story window is in the neighbourhood of 2 feet from the floor; the second-story should be higher. In a case where the windows are in danger of affording the passerby opportunity to look through, they should be about 3 feet from the floor; a fixed window seat or settle would be well in connection with them. Kitchen and bathroom windows should naturally be fairly high. A little care and thought in this direction is a good thing all round, as it adds to your own personal comfort and privacy, while on the other hand the neighbours will not know as much. It is no one's business but your own whether you wear red, green or yellow stockings, or go barefoot; whether you sit cross-legged or hang your feet on the mantel top. There may be extravagances, but one is responsible only to oneself. Look to it, then, that your windows are high enough from the floor for your ample protection.

An example of the English casement window as applied to the bay. This very simple type has the English diamond panes, and is inexpensive, being in a stucco wall

In northern latitudes the window should be carried well to the ceiling, as against the lower window of the tropics. In the high-studded room the transom can be used to advantage; it should be employed wherever possible, as it ventilates the room where ventilation is most needed. There should be, however, a studied relation between the window and door trims, so as not to disturb the general *ensemble* of the interior. Corresponding horizontal lines are to be striven for in all such problems. For instance, the height of the door, if not carried to the cornice, might be on a line with the top of the window proper, the transom of which extends to the cornice; again, the door, if there be no window transom, might have a surmounting frieze and a crown mould, which should be the same as the mould on the window top and at the same height. There are several ways to preserve these lines; the main thing is to see that they exist.

In the early glass division of windows the panes were small. The medium-sized panes have their advantage, as they are readily replaced when broken, even

in the rural districts. Another consideration in the glass division of the window, and one of great importance, is to arrange the horizontal divisions in such a manner that sitting or standing near the opening the vision is not obstructed by them. This may require some engineering on the part of the designer, but it is well worth the while. The principal difficulty comes from the difference in the height of different people. The very small panes of the early colonies are rather inconvenient in this; besides, they are hard to clean. The medium-sized glass is better, and if the lower sash is not divided at all in its height, the problem is simple. It is always annoying when standing at a window to be obliged to dance up and down in order to see out of it.

Entrance motive to house at Cambridge, Mass. The recessed windows above give added space to the balcony. The side lights below are rich and simple

To some tastes the large plate glass seems to be the only desirable thing. To be sure, one gets an unobstructed view, but replacing it is expensive and often inconvenient, especially if one's workman and material have to come from a distance. Then, too, some may object that a large plate lets in too much of the out of doors. Surely the lines of the room are in a measure destroyed by it, whereas the smaller panes tend to their preservation and to give the outside view the effect of a decoration. Further, if we get all the effect of the outside from the more or less close confines of the interior, there is less incentive to stir out of doors. As anything which tends to destroy the harmony of the general

design is to be carefully avoided, it is well to give the question of large and small panes some careful consideration.

There are three kinds of windows in common use in this country. In the ordinary two-sash window the sash are hung by a cord or chain playing over a pulley in the top of the pulley stile, and balanced by weights hidden in boxes on either side. The French, or casement, window is hung on hinges and swings into the room. It is often made in two vertical halves, which operate as does a double door. It frequently extends to the floor, and hence is used as a means of access to balconies or piazzas. The English casement window is very similar to the French, only that it does not extend to the floor and generally swings out. For common use the first is to be preferred, although but half the glass area is available for ventilation. With the addition of the transom, however, the ventilating area should be sufficient, even in our Northern climate, where highly heated houses require a considerable change of air. This form of window is as tight as a window can be. With us the French window is mostly used in its capacity of door. If used in an exposed position it should be very carefully adjusted, as it is more liable to leak than either of the other two. It should be panelled at the bottom to the height of the other window stools; first, to preserve the lines, and second, to avoid damage by

Entrance motive to house at Lynn, Mass. The Palladian window surmounting the porch is evidently part of the lighting agency of the upper hall. The estimated cost of the various parts are: Porch $390, Palladian window $120, door motive $150

children. In the matter of ventilation this window will do all that is possible, and its inward swing allows of the adjustment of storm sash. The English casement window is generally used in the upper story or gable end, where the space is small and the inside swing would be in the way; also where small mullions are desired in place of the more or less bulky weight boxes of the sliding sash. Owing to its opening to its full area, it makes a good window for the attic, where the heated roof requires the full measure of air. It should not be used, however, where storm windows are desired, as their outward swing makes the adjustment of the latter impossible. It is somewhat tighter than the French, but does not exclude the weather as does the sliding sash.

Mullioned window in old house at Flushing, Long Island, N. Y. The blinds should have been hung in two pairs so as to obtain the full light area

The forms of windows are numerous. Those in common use are the single square-headed window, the round-headed window, the mullioned window and the Palladian motive. The first two need no further description. The mullioned window is a motive in which two or more separate windows are placed side by side, usually as close as their construction will permit. The Palladian motive was original with the Italian, Andrea Palladio, who was born about 1518. The English copied it extensively, and it became common with us in the Colonial. It consists of a mullioned window of three divisions, the central and larger of which had originally a round head. The two flanking windows were smaller and terminated in a square head at the spring of the central arch. Both the mullioned window and the Palladian motive are used in important locations. The staircase window takes on many forms, and has been the object of much invention.

The bay window is a projecting window motive too common and too varied in form to call for much description. Briefly, it is a several-sided and moderately sized break in the straight wall, usually well filled with glass, and affording a view to the right and left as well as to the front. It may extend to the ground, in the case of the first story, and have a foundation of its own, or it may overhang at the floor, window seat or sill level, and be supported by brackets or otherwise. It is a convenient and admirable feature in the country house and worthy of consideration, which it has not always received.

With the bay, the window seat naturally suggests itself. This is better built

into the window motive, and thus made a fixed part of it, although in a square bay a settle or couch can be used to advantage. As we all know, the accumulation of odds and ends, which it is often desirable to keep, makes it necessary to provide some place for their storage. Newspapers and magazines, remnants of toys, odds and ends of various kinds, are very apt to find no really safe hiding place when gathered up in a hurry. You may lay down rules forbidding their wholesale distribution from cellar to garret, but prohibition will hardly prohibit. With this in view it is well to provide the window seat with a hinged cover, so that the otherwise wasted space can be utilised.

Interior of window shown on opposite page. A good example of the use of corner block and head panel

The hanging of window curtains and shades is more often badly done than well done. This is partly due to the lack of calculation in the designing of the window motive and the hanging itself. As blinds, screens, storm sashes and solid shutters enter more or less into the calculation, let us consider the whole window with all its embellishments. In the first place, owing to the lowness of the sun in northern latitudes, the curtain seems to be an essential, but it should never be allowed to destroy the effect of the window casing, as it usually does. In the better houses of the Renaissance, the window curtains were straight pieces of fabric, hung across the window opening; they were often omitted entirely. They should never be too heavy. In fact, if they are thin enough to admit of seeing the architecture through them, it is better. Fig. 15 shows one method of building an architrave, when the curtain is to be considered as a permanent hanging. The reveal (a) allows for the setting in of the curtain rod (b) and the shade

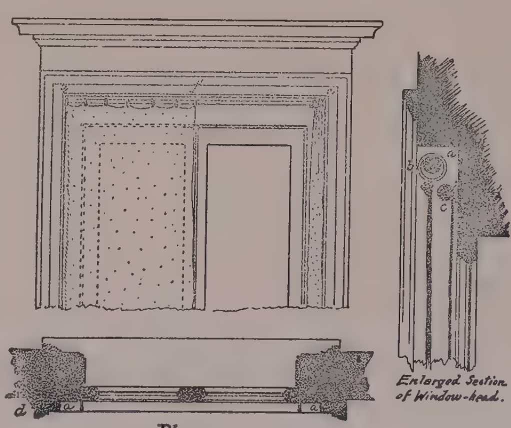


Fig. 15. One method of building the casing when the hangings are to be considered as permanent

a. Reveal b. Curtain rod c. Shade roller

fixtures (c) so as not to destroy the window outline, and at the same time cover the glass opening fully. A small curtain pole is preferable to a large one wherever it will hold the weight required of it. If it is so that the reveal forces the back band too far into the room, the moulding (d) can be used. Although the reveal can be used with any window, the cut illustrates its adaptation to the French style, with the idea of showing how the curtains can be managed easily, so as to interfere with the window swing. A cord, the middle of which is fastened to the inner ring at f, and running through the other rings (except the last ones), is carried through double pulleys back of the curtain at the angles (e-e). The ends, terminating in tassels, are allowed to hang with the curtain. The other half of the hanging is treated in like manner, and it is readily seen that the pulling of one pair of ends will open and the other close the curtain. The fact that the hangings are frequently draped back at the bottom does not interfere with the working of this scheme. The shade should always be hung on the outside of the window opening and never in it, as it is liable to admit stray shafts of light at the sides, which are extremely annoying at times.

Old church window at Newburgh, N. Y. A good motive for the simple and effective handling of the staircase window

Fig. 16 shows an arrangement of a three-opening mullioned window in a brick wall, in which the central one is a French window opening on a piazza and the side openings are of the sliding sash type. With this as a basis, let us continue with the window embellishment. It will be readily seen that curtains can be hung on the inside of the recess, and shades be placed near the sash and managed in the manner already shown. Owing to the awkward swing of the French window into the room, which is more or less objectionable when treated singly, the side window seats with large ends naturally suggest themselves. This does two things—it takes care of the

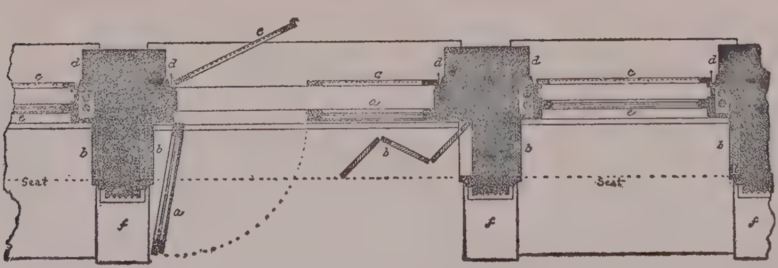
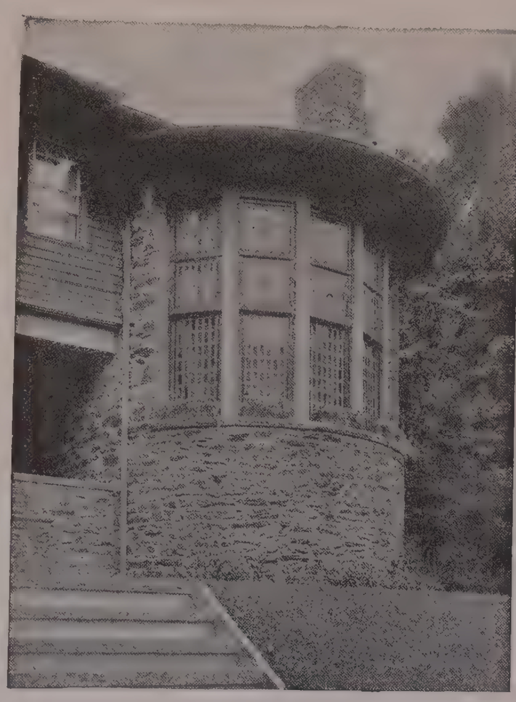


Fig. 16. Plan of a three-opening mullioned window in a brick or stone wall in which the central opening is a French window

a. "French" window sash b. Inside blinds c. Outside screens d. Outside reveal c. Sliding sash f. Seat ends

open window (a), and makes an added feature of the seat. A door stop properly placed will prevent the window from marring the seat end. As blinds on the outside of a house are always awkward things to get at, and as the chances for inside ones in this case are excellent, they have been adopted (see b-b-b). They should be, if painted, of $1\frac{1}{4}$-inch clear pine stock, fitted with movable slats in the lower half and hung on wrought-iron or brass angle butts. The man who invented the adjustable window screen meant well, but he fell flat at the start. What we buy at the department store for nineteen and one-half cents each is a very good article—that is, to keep the flies in; it surely does not keep them out. The more expensive kinds are no better; they make you think so because of their price. When they are in the window they leave an opening between the sash, through which flies and mosquitos swarm in delight. The more simple form of half screen, which slides from top to bottom of the window opening, is better. Unless the sash are thrown wide open, however, it leaves that same little space between the sash as an invitation to the undesirable, and not infrequently we wish the window only open in part. The best form of screen is the full-sized one hung on hinges on the outside of the window casing (see c-c-c). Its being hung allows the washing of the window, and, at the same time, its covering of the whole opening permits the window to be opened in any manner desired. As is frequently the case during stormy weather, it is desirable to open the sliding-sash window at the top for ventilation. If the outside reveal (d-d) is not deep enough to protect the window head, as in a wooden wall, the screen should be built with about four fixed blind slats at the top. This will keep out the weather, will not inter-

Portion of house at Wayne, Pa., showing treatment of Elizabethan bay. Wm. L. Price, architect



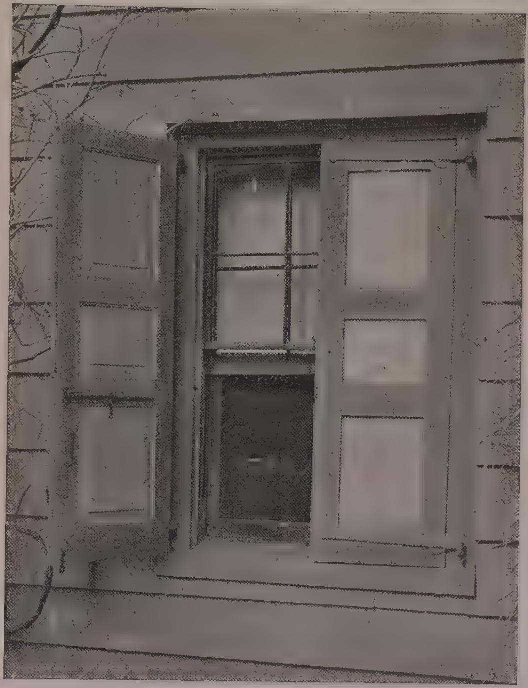
A semicircular bay, lighting a high-storied room

fere with the ventilation, and as there is plenty of light in the summer it will not cut off enough of this to count. Of course in the case of outside blinds this is unnecessary. Copper wire makes the best screen covering, although the most expensive; common wire rusts in spite of paint and soon goes to pieces. If copper wire be beyond the reach of your purse, galvanised wire is the next best thing. Where the outside blind is desired, it is better to employ some form of "opener" which manipulates it from the inside. In this case the blind can be arranged to work outside of the outer screen. Great care should be used in the arrangement of the outside blind, to see that it always lies flat to the wall when thrown open and does not come across other openings. In the shingle-window motives the problem is somewhat simplified, but the mullioned window is apt to give considerable trouble in this direction, and bay windows are simply out of the question as a general rule. A good form of inside blind is the "Venetian." In this the slats are affixed to wide tapes, and the blind is capable of being condensed into a space equal (theoretically) to the thickness of the slats. Where they are used an ample pocket should be provided for at the top of the window motive. If this is not

Excellent glass motives, both in the treatment of the doorway and the high bay. The latter might well be adapted to the staircase motive

done they will have to be hung in the regular pockets, which are awkward in the extreme.

A wicket or swinging sash should be provided for ventilation in all storm windows. This usually occupies the space of one pane of glass and should swing inward.



Window in old Bowne House, Flushing, Long Island, N. Y. The solid shutter, common during the Colonial period, was frequently pierced through the upper panel by a crescent or star form for the admission of a faint light

All storm sash, storm doors and screens should have a number to correspond with one on the casings of the several windows. These are best cut in with a knife, using the Roman numerals for simplicity in cutting. As these various accessories are fitted to the individual openings, it saves much time and bother, occasioned by getting the wrong thing in the wrong place. Solid batten storm shutters can be affixed in the same manner and from the same screw eyes as the storm windows (see "Practical Hints"). This shutter is an essential where the house is to be closed for a part of the year. The storm shutter should always have a small perforation in its upper half so as to shed a ray of light into the room. This is necessary in the opening and shutting of the house, otherwise it would be left in absolute darkness, and furniture and pet corns are liable to suffer in consequence. The shutters of our forefathers were frequently pierced with a small star or crescent, which was evidently an after consideration, judging from the manner in which it was done. These forms are good, but, whichever is used, it should not exceed 4 inches in diameter. It is better if the piercing be glazed; the Colonial bull's-eye light is not bad for this purpose.

A good form of storm shutter for the summer home of those who can afford it is one made on the lines of the old, simple-panelled Colonial shutter (see the Bowne House at Flushing). This old form should be reinforced with matched sheathing, between which is sandwiched a piece of sheet iron, firmly bolted through the stiles and rails. The bolts should be placed with the heads on the sheathing side and the reverse end welded down after the nuts have been set tightly in place. These shutters should be hung permanently on heavy wrought-iron strap hinges, so that when open the panelled face is outermost. The effect thus obtained is not at all unpleasing. If hung in pairs, strong bolts can be used to secure them. In some of the later work a shutter is used in which the upper half is a blind with fixed louvers, and the lower half is panelled.

It must be remembered that any shutter, no matter how strong, is not im-

pregnable. To he who premeditates burglary its removal is like the cracking of a nut—an extreme pleasure in anticipation of the meat within. Its only purpose is to discourage the attentions of honest folk and small boys. Screens may answer for flies and the like, but the successful barring of one's own kind is an Utopian dream too good to be realised.

A second-story bay at Newburgh, N. Y., with effective glass divisions. The oval Colonial window makes an excellent closet light

Windows, although differing slightly in the minor details of construction, are in the main alike. Frames of those set in wood, brick and stone walls, and in the cellar window, differ considerably in the manner of adjustment.

The ordinary window in the wooden wall is shown in Fig. 17. We will refer to this in its description.

With the exception of pulley stiles, stop beads and often the yoke, which are of hard pine, the sash, outside casings, sill, and the inside casings (where paint is used), are of white pine. The usual dimensions of stock are as follows:

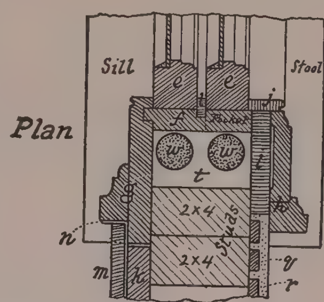
A bay at Newburgh, N. Y., used in connection with the gambrel roof. The stone underpinning extends to the window sills and gives a generous stool on the inside

Sash to carry double thick German glass, $1\frac{1}{2}$ inches; sash to carry plate glass, 2 inches; sills, 2 inches; casings, $\frac{7}{8}$ inch; stop beads, $\frac{1}{2}$ inch; pulley stiles, $\frac{7}{8}$ to $1\frac{1}{8}$ inches; yokes, $1\frac{1}{4}$ to 2 inches; stools, 1 to $1\frac{1}{4}$ inches.

The sill should have a $1\frac{1}{2}$-inch pitch so that water will be readily shed. The bottom of the outside casing where it intersects the sill (u) should be cut out to allow water to drain from sash groove. Flashing (n) should be of 16-ounce copper or lead extending 3 inches under the outside wall covering. Never use tin. The spaces above the yoke and under the sill should be caulked with plaster.

The sash are usually hung on sash cords, the better sort being braided or woven. Metal chains, though they cost more, will last longer and are to be preferred. The common window weight, which is enclosed in the box behind the pulley stiles, is of iron. For heavy windows lead weights are better, as iron, at the weight required, becomes too bulky. Care should be taken to see that the weights properly balance the sash, otherwise there is sure to be trouble with the windows not staying in place. Axle pulleys over which the window cord or chnia plays should be of the best pattern and have ordinarily about $2\frac{1}{2}$-inch wheels.

The window pocket is cut in the lower half of the pulley stile and in the groove of the lower sash. It is used in the hanging of weights and also to repair broken sash cords and for like troubles. As the stop bead has to be removed in order to get at the pocket, it should always be screwed in place. Always fasten a stop bead with round-headed screws.



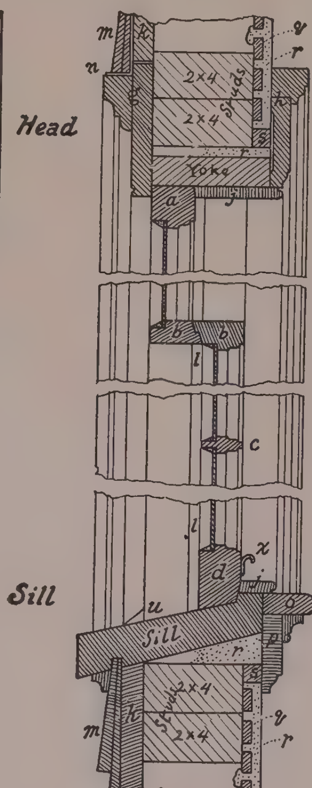


Fig. 17. Sections of a simple window frame in a wooden wall

a. Top rail (upper sash)
b. Meeting rail
c. Muntin
d. Bottom rail (lower sash)
e. Sash style
f. Pulley style
g. Outside casing
h. Inside casing
i. Ground casing
j. Stop bead
k. Outside boarding
l. Parting bead
m. Clapboards
n. Flashing
o. Stool
p. Apron
q. Lathes
r. Plaster
s. Ground
t. Weight box
u. Drain for sash groove
w. Weight
x. Sash lift

Much trouble is occasioned by the binding of window sash in damp weather. This in a measure is unavoidable, owing to the excessive swelling of the white pine. To avoid the excess of it the sash should not be fitted too snugly; a little play is necessary. As the dry weather will shrink the sash and perhaps allow it to rattle, it would be well to use a narrow rubber-edged weather strip on the vertical stop beads, to control the lower sash and correspondingly to control the upper sash on the inner edge of the outside casing. It is well to bevel slightly the edge of the top rail of the upper sash (a) and the stop bead which engages it, so that when the window is closed it will be held firm. The bottom rail of the lower sash (d) is held in like manner, and a sash-fast is used which will draw the meeting rails together. Thus there should be little trouble with the rattling or leaky window, even when the sash have ample play in the grooves.

A very necessary adjunct to the above fittings, and one which adds much to the ease of manipulating the window, is the sash lift. Two should always be provided for on the bottom rail of the lower sash; they are preferably of the projecting sort. It is well also to have two mortised lifts set in the top rail of the upper sash, as there is little or nothing to get hold of in case it should bind. With lifts thus adjusted, one has less fear of breaking glass, and possibly receiving an ugly cut.

As a matter of utility, the stained sash is to be preferred to the painted one, as paint is very apt to stick, damp weather tending to soften it.

The construction of the window as set in the brick wall is shown in Fig. 18. The principal thing is to see that the joints between the brickwork and woodwork are made weather tight. Thus the intervals are filled in with plaster or cement as shown, and the staff bead (k) is adjusted after the window has been built in. It is well to bed the staff bead in elastic cement, a mixture which partakes of certain

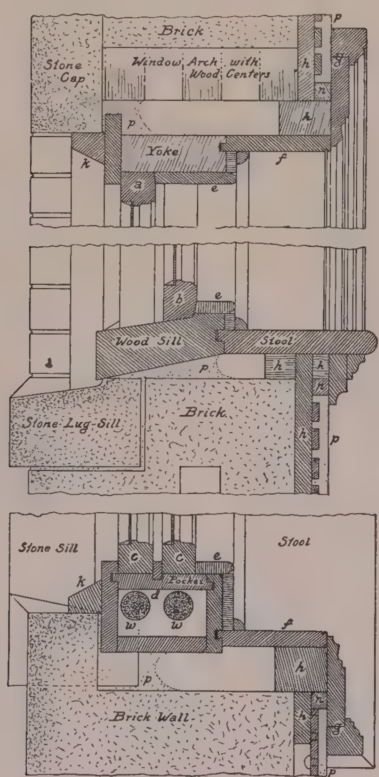


Fig. 18. Sections of a window in a brick wall

a. Top rail
b. Bottom rail
c. Style
d. Pulley style
e. Stop bead
f. Finish
g. Casing
h. Furring
k. Staff bead
n. Ground
p. Plaster
w. Weight

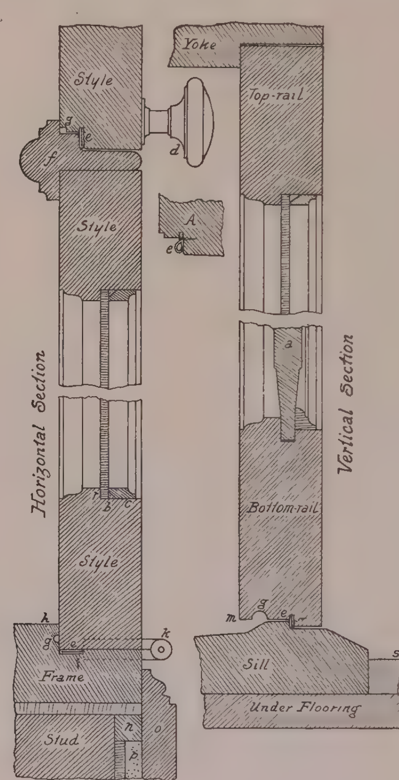


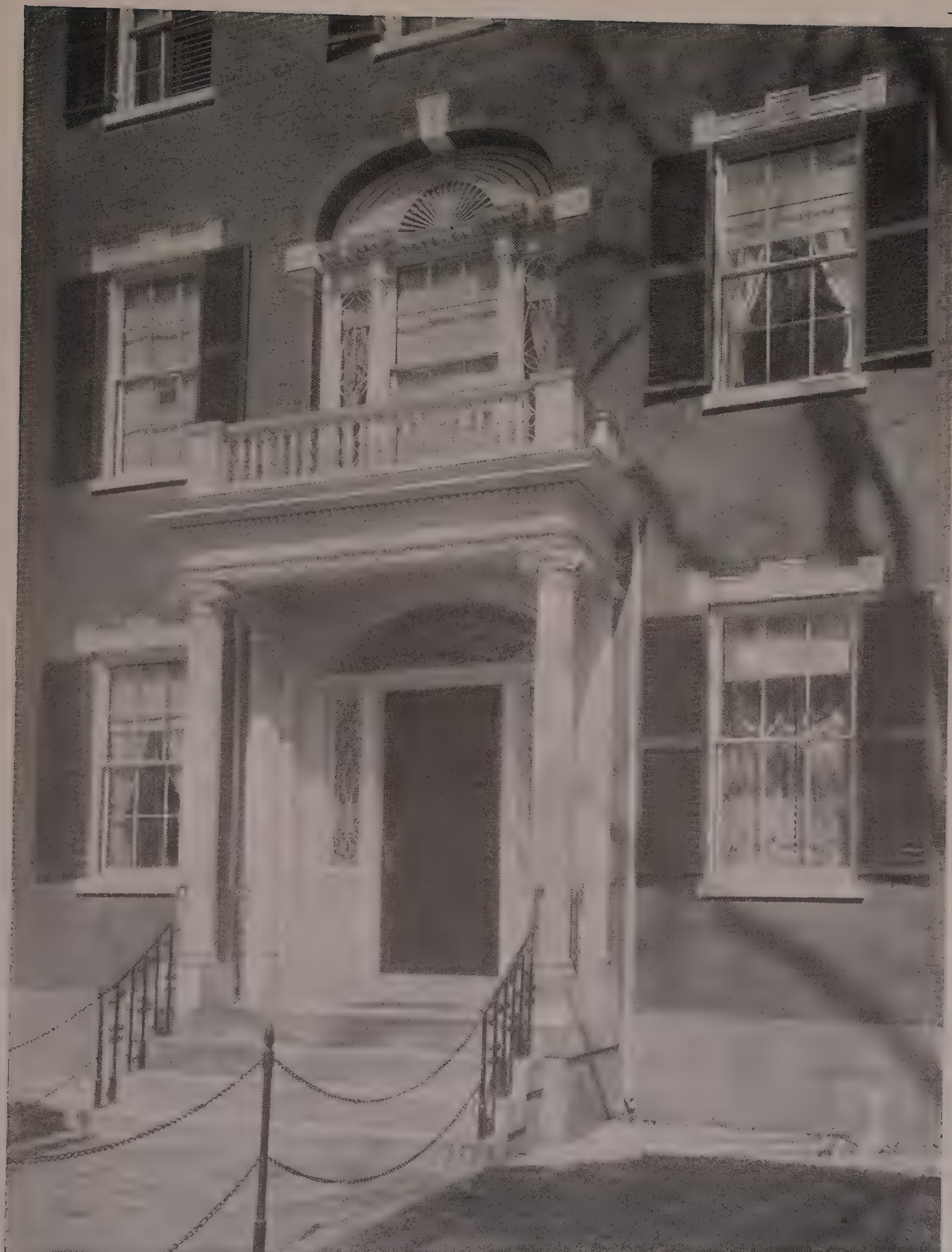
Fig. 19. Showing the construction of a "French" window

a. Wood panel
b. Putty
c. Stop moulding
d. Knob
e. Rubber weather stop
f. Weather moulding
g. Canal
h. Drain to canal
k. Hinge
m. Drip
n. Ground
o. Inside casing
p. Plaster
r. Putty bed for glass
s. Upper floor

A. Section of style showing the natural bend of rubber when not engaged with f.

properties of putty and glue. As it can be said practically never to dry, it thus, with its elastic properties, makes an excellent joint for any similar case.

Where the window is set in a stone wall, especially if the stone be rough field stone, the care in caulking joints becomes yet more important. Some claim that the frame should be set after the window opening is constructed. As this receives the support of some of the best authorities, it is worthy of consideration. However, if the staff head be bedded in elastic cement as already described, there should be little trouble with a built-in window frame.



Entrance motive to the Emerson house at Salem, Mass. Remodelled by Arthur Little, architect. This example shows some very interesting handling of simple and elaborate window treatment. The true Colonial feeling has been retained.

The French window, from the fact of its inward swing, requires extra precaution to keep out the weather. Fig. 19 shows a simple and effective method of construction. A weather strip of rubber is suggested as a simple way of rejecting moisture and air. It is easily replaced when worn out (as all things will be sooner or later), and as its natural form (as shown in A) suggests, it will tend to overcome any slight looseness of the engaged parts. These strips are reinforced by the canals (g), which allow water to discharge itself naturally before it can get at the rubber. In the case of the canals in the upright jambs, a drain is cut at its intersection with the sill, similar to the cut made in the outside casing of the ordinary window. The plate glass is best set in a putty bed (r) and held in place on the inside by the moulding (c) with putty bed (b). Owing to the swinging of the sash, putty alone is not sufficient to withstand the jar thus occasioned. The moulding or stop (c) should be affixed with screws, in order that its removal in case of broken glass may be made easy.

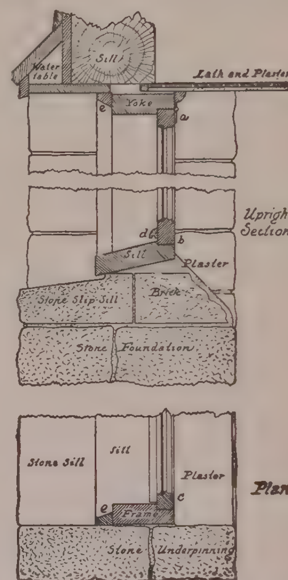


Fig. 20. Showing the construction of a cellar window

a. Top rail b. Bottom rail c. Style d. Drip e. Staff bead

Fig. 20 shows the construction of a cellar window in a stone wall. The frame is built into the wall when laid, and is of 2-inch stock. The sash is hinged at the top, provided with a drip moulding (d), and is best glazed with double-thick German glass. It is secured by a button at the bottom, and held open by a hook which engages a screw eye affixed to the ceiling. It is always better that the hook be placed in the sash, as it can thus be fastened open with one hand, and, further, it gives something to take hold of in case the window should stick, and thus does away with the special knob for that purpose. To protect the staff bead from the weather and keep the water from running in upon it over the face of the horizontal finish board, a drip (d) is provided in the lower member of the water table. Fly screens should be placed on all cellar windows. They can be fastened to the outside frame, and screwed on from the outside, or a rabbet can be made in the frame to receive them. Canals should be cut in the bottom rail of the screen frame, to let off such water as may find its way in. If an iron grating is desired, it would be better to have it screwed on from the inside, perhaps inside the screen. Whatever way it may be adjusted, be sure that it is not made too easy for the man who comes to "borrow" the coal. A grating always looks ten times more formidable when seen through the uncertain meshes of a fly screen than it does when exposed in open defiance with all its frailty.

The "transom" window is constructed somewhat on the lines of the cellar window, being on the same principle. It is hung at the top or bottom, as the case may be, and is manipulated by means of a transom rod, a contrivance which passes down the architrave to within easy reach. The pitch to the sill of a transom window should be fairly quick, so that all water will meet with sufficient discouragement at the start.

In the Peabody Institute at Danvers, Mass. A good example in marble, but the two canker worms trying to crawl up the sides detract somewhat from the dignity of the composition

CHAPTER VII

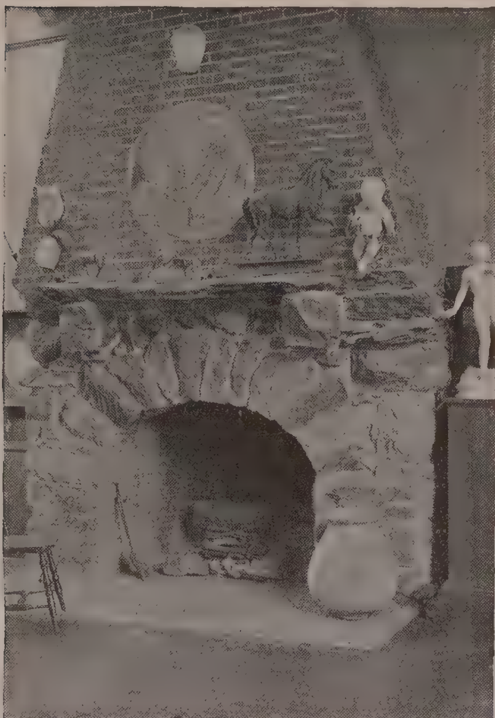
Fireplaces, Chimneys and Fireproofing

IT IS a far call from the primitive open fire to a modern fireplace. There is but a slight difference, however, between the fireplace of to-day and that of the Middle Ages. In other words, the development, having reached at a certain point a high measure of fitness to the necessities of the situation, practically ceased thenceforward.

We can still see, in the huts or wigwams of the savage, the raised hearth which primitive man built in the centre of his abode. The smoke from this escaped through a hole in the roof, or even through any adjacent door or window. During the Middle Ages the hearth was set against the wall and a projecting hood of brick or stone built above it to carry off the smoke. This was an approach to a safer and more useful fireplace, and the hood was used for a considerable period.

Gradually the fireplace was built with two flanking jambs, which supported the hood or breast, and thus the main principles of the present form of fireplace were evolved. The hood was later abandoned and the straight chimney breast adopted. Notable examples of this treatment are those of the Château Blois. As the armorial bearing was a prominent feature of decoration in those times, their use in the treatment of the fire breast became common, and the already important fireplace became the central and chief feature of the room. At a later

period the fireplace was let into the wall, as in the common form to-day. The Italians, however, retained the hood for a considerable period, as a decorative feature too important to be discarded.



Hooded fireplace in studio of Mr. Will H. Low, Bronxville, N. Y. A design well adapted to the unconventional den or billiard room

At first the fireplace opening was of small dimensions, but on the theory that the larger opening meant an increase of heat, it was enlarged to great size. Then, when the tendency to draw children and furniture up the chimney or let in all the outside cold through the enormous opening found little hindrance in the iron doors employed to remedy the defect, a return to the smaller opening was felt a relief.

The best forms of old fireplaces were let into the wall, leaving no disturbing break projecting into the room. This was made possible by the thickness of the walls used in those times. To overcome this difficulty, especially in the case of the wooden wall, the Colonials (to take one example) furred out the flanking walls to the face of the chimney breast and employed the recessed window seat, so as not to waste room. As the fireplace was usually in the centre of the wall, it gave a chance for the recessed seat on either side—a charming motive, much and wisely used in modern work. Of course, in a case where the chimney is in some inner wall the window seat becomes impossible. There is, however, the buffet and the closet as well as the straight alcove, an excellent place for furniture, owing to its slight depth.

It is hardly worth while to go into a detailed enumeration of the various forms of the historic fireplace. From the early stone fireplace down to the present day many varying forms and materials have been used. The wooden mantel, now so common, had one of its greatest sponsors in the English, who obtained very elaborate and often pleasing effects.

Early fireplaces were lined with stone or brick. Later an iron lining was used. Nowadays we find brick, tile and iron, but the average iron lining is so abominably bad in design that its lack of use reflects credit on the man who builds in any other way. The old fire frame of the later Colonial period, which sets well into the room, from the fact of its large radiating surface is an excellent heater as compared with the ordinary fireplace. It makes a most practical motive for the chamber, as it is small in scale and size, and it is strange that it is not more used. Perhaps, too, at some not far-distant period, some one who is given to using his own brain in the solution of the building problem may discover

that the old fire frames can be adapted in a most ingenious manner as a fireplace lining. He may discover, furthermore, that if this fire frame is used within a larger fireplace it still retains its radiating surface and at the same time loses its ordinary disadvantage of intrusion upon the floor space (see Fig. 21). He might even fill up the space about the fire frame with perforated metal work, which would give him practically a very small local heater and a comparatively large register. As most of the generated heat from a fireplace goes up the chimney under ordinary circumstances, this idea is worthy of some consideration. If the fire frame is not obtainable, the "Franklin stove," its descendant, will answer just as well; be sure, however, that you amputate the legs and set the stove directly on the hearth.

If the iron fire back of decent design can be obtained, it is advantageous to use it, as it withstands the heat and radiates better than any other material. Reproductions of old work are apt to be better in design than the modern product, but this rule is not without exceptions.

Toward the latter part of the seventeenth century coal began to be used, and the English wood-burning fireplaces of the period were modified for its accommodation. Basket grates set inside of the moderately sized fireplace seem to have solved the problem better than the fixed grate, as its removal for the burning of wood is an added advantage. Many of the old basket grates, and a few of the modern examples, are excellent in design. The principal trouble with all this ironwork, both the fire back and the grate, was the tendency to overcrowd it with cheap ornamentation. Restful simplicity wears better and becomes less tiresome on long acquaintance. In the modern country home all things should work together for restfulness.

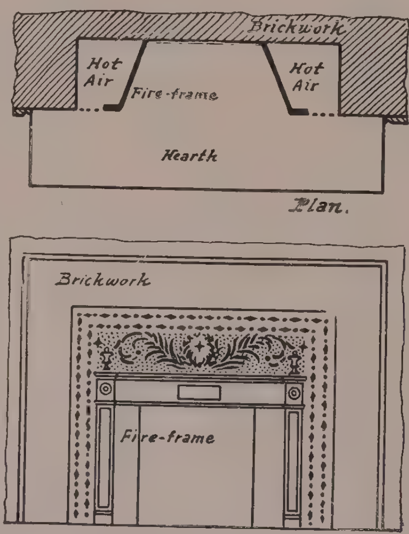


Fig. 21. Showing the use of the old fire frame in the larger fireplace opening. A pierced metal screen is used as a facing about the frame

A delightful example of delicate detail in the Ladd House, Portsmouth, N. H.

The wooden mantel with the wooden architraves calls for a fireproof facing between it and the fireplace opening. Brick and marble were used for this, as well as the charming Dutch tiles now so sought after. Some authorities lament the use of wood in the above capacity, arguing that it looks, and is, inflammable. This is true, but nevertheless the better work of the designers in wood does not seem to alarm the most of us, and as a matter of fact there is more cause for worry in the poorly constructed chimney and its relation to the concealed woodwork, which cannot be gotten at in case of trouble. Then, too, the wood must begin somewhere, and the stone mantel is hardly in place in a room when it is the only material of its kind used. Those who have considered the problem with any degree of understanding have done their work well, and it is to be remembered that there are people of considerable taste and small purses who cannot afford the marble or even the tile fire breast, even were it in good taste. Brick is cheap, but not always in harmony with the rest of the room. These same authorities insist that the architrave of the fireplace should extend to the opening, like that of the door or window. Now it does not require a very lengthy argument to demonstrate to the ordinary individual that the fireplace is neither a door nor a window, or that the principles governing the latter cannot control the more stringent ones of the former. It is the province of architecture to accommodate itself to the principles of construction and utility, and not the reverse. The architecture that has made itself subservient to, and at the same time harmonious with, these principles, is the better architecture. True design is not *constructed decoration* but *decorated construction*. It is not denied that the fireplace architrave may abut the opening, if the thing be feasible, but it is denied that its separation from it by the usual facing, in the case of wooden trim, is not just as good and pure design. A facing of from 8 to 12 inches is safe enough, but it should not be less than this.

Mantel in the Nichols House, Salem, Mass. A successful rendering in which the flanking beams retain the squareness of the ceiling and serve to tie the motive to the rest of the room

With the craze for bric-a-brac the mantel shelf became a thing of much importance and was much enlarged. From the simple and pleasing design the wooden stock mantel has departed, and has given us a hideous grotesque of innumerable shelves, spindles and jig-saw work, fit to raise the old designers from

their graves. Bric-a-brac is best used sparingly; a mantel should not be cluttered with it. The clock, a couple of vases, and perhaps a pair of candlesticks, should answer the purpose. There may be cases where more is desirable, but each addition to the above tends to more; big museums are stocked in just this manner.

The common forms of adorning the over-mantel are by the use of the mirror or the painting. These are best confined within certain lines, which are naturally a part of the design. In the case of the mirror it is better that the clock should not cut across it awkwardly; the clock back is not apt to give a beautiful reflection, as is the case with the vase. Anything which is not intended to be inspected from all sides should be thus considered. In the case of the painting, nothing should be allowed to interfere with its outline, and for this reason it should be placed high enough above the mantel shelf to avoid such possibility.

A modern hooded Gothic example at Fairhaven, Mass. Charles Brigham, architect

Draperies and textiles of all sorts should be kept away from the fire breast; their inflammability makes them dangerous, and for this reason, as well as others, they look out of place.

On general principles, the country house requires a less elaborate fireplace than

the city house. It should harmonise with the room, and its lines should be in keeping with those of other motives therein. Rough stone and all other bold and unconventional motives should not be used in the conventional room. Such materials belong in the den, studio, or wherever the scheme is strong enough to hold them. The unconventional should never be forced upon the conventional; like oil and water, they will not mix.

The accessories of the fireplace—viz., andirons, tongs, shovel, fenders and coal scuttle—should be carefully chosen; otherwise a true harmony of effect is impossible. Their being necessary adjuncts to the general utility makes this care in selection doubly important. In addition to the general design, the matter of scale should be considered. Accessories either too small or too large look out of place. The articles in question are commonly constructed of wrought iron, brass and bronze. Iron and bronze require little care to keep them looking trim, while brass, on the contrary, requires labour spent in polishing. This extra work may mean much to some of us, but that a good bit of polished brass is clean and effective is undeniable. The common method of disposing of the shovel and tongs is to stand them in little hooks or racks at either side of the fireplace. This is the simpler and better method, although the old movable rack may be used if desired. The old solid fenders are by far the more artistic, but are less effective against flying sparks, as well as heavier and harder to move than the folding-screen patterns of later date.

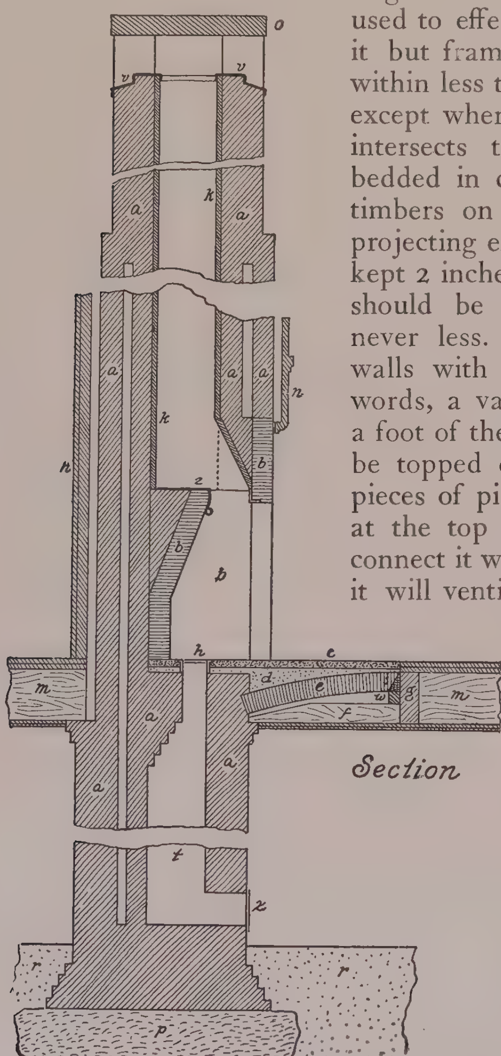
The fire screen is often a thing of beauty when designed on the lines of furniture, in which light it is best considered. Some of these in the style of the Louis's, with their tapestry panels, are very beautiful; those of the Colonial period are both dainty and unique. It is better that the back should not be covered with fabric, as such is more inflammable than wood, and at the least is liable to be scorched. If the wooden panel be covered with asbestos paper it is safer yet. The long line of designs headed by the huge peacock and the stained-glass freaks are not to be considered for a moment, although the latter may be made creditable in the hands of a good designer. If a fire board be used to close the opening in summer, it should be fittingly designed for the purpose and not be covered with remnants of the wall covering; and if it be dark in tone it comes nearer to the ordinary conditions suggested by the open fireplace. It may be desirable to leave the fireplace open for the purpose of ventilation—a very wise proceeding. It is very apt, however, to smell of soot, especially in damp or rainy weather, but since a small fire is usually required at such times this objection is of small account.

Where wood is used for fuel, some provision must be made for its storage. To the collector of antiques the old chest naturally suggests itself, while the flanking window seat with a hinged lid may effectually solve the problem. In such case it is wise, owing to the liability to scatter dirt through the house, to make provision for supplying the woodbox from the outside, when, as in the case of the window seat, it comes against the outside wall and is fixed. This is readily done by making a panelled door under the window motive and under the seat; a door which is made on a matched batten and fastened from the inside is best. This door may have a panel or any other treatment on the outside.

A library alcove at Chestnut Hill, Mass., showing a simple and practical treatment. The sharp projections on the ends of seats, however, are very apt to tear skirts

As to fireplaces in general, it is best to have them in all available rooms, including chambers. They are the best of ventilators, and in the late spring and early fall serve admirably to remove the chill from the house. In this way they serve to curtail, for a time at least, the generally excessive heat of the furnace or other heater. They are also excellent in case of sickness, for the above reasons.

As the chimney and fireplace are naturally and commonly the cause of many fires, their construction should be carefully looked after. Fig. 22 shows an effective method for their safe construction. The chimney should in all cases be carried up from the ground and never allowed to rely on any woodwork for support. No chimney should be corbelled out more than 8 inches from the original line, and then five courses of brick should be used to effect it. Floor timbers should not be let into it but framed around it. No woodwork should come within less than 2 inches of the brickwork in any case, except where the jamb of the wooden breast or mantel intersects the fireplace facing; this jamb should be bedded in cement. Where it is desirable to rest floor timbers on the chimney wall it should be done on a projecting engaged pier and the ends of the timbers be kept 2 inches from the chimney. The rough brickwork should be 8 inches thick outside of the flue lining; never less. A better method is to make two 4-inch walls with a 2-inch air space between or, in other words, a vaulted wall. This can be carried to within a foot of the under side of the rafters, and the chimney be topped out with 8 inches of brickwork. If small pieces of pipe 6 inches long are laid in the brickwork at the top of this air space in such a manner as to connect it with the flue at the nearest joint of flue lining, it will ventilate the air space and so tend to lower the



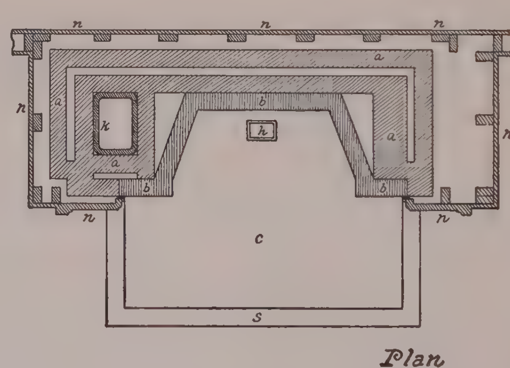


Fig. 22. Showing a safe method of chimney and fireplace construction

a. Rough brickwork
b. Brick facing
c. Brick hearth
d. Cement
e. Trimmer arch
f. Furring
g. Header
h. Ash-pit cover
j. Skew back
k. Flue lining
m. Floor timber
n. Wooden partition
o. Stone chimney cap
p. Footing stone
r. Cellar bottom
s. Hearth border
t. Ash pit
v. Copper chimney flashing
w. Fillet
z. Damper

temperature of the brickwork. Holes should not be made in the base of this air space, as the draught thus formed would tend to unequal conditions calculated to crack and destroy the brickwork. The argument against this method of construction will be on the score of space and labour, but no space or labour should count when safety from fire is at stake. The two walls should be tied together with headers every six courses in the manner of a vaulted wall, which they really form. Under no circumstances build a 4-inch chimney; such work is criminal. It endangers the lives of all the occupants of the house, which are surely worth the additional expense of a good job. An expert should be on the work continually to see that the chimney and fireplace are properly constructed.

An interesting dining-room fireplace of brick and painted stucco

All flues should be lined with terra-cotta or burnt-clay linings, laid with close joints. They should extend from the bottom of the flue and throat of the fireplace to the extreme top of the chimney, and should be built in with the brickwork as the chimney is carried up.

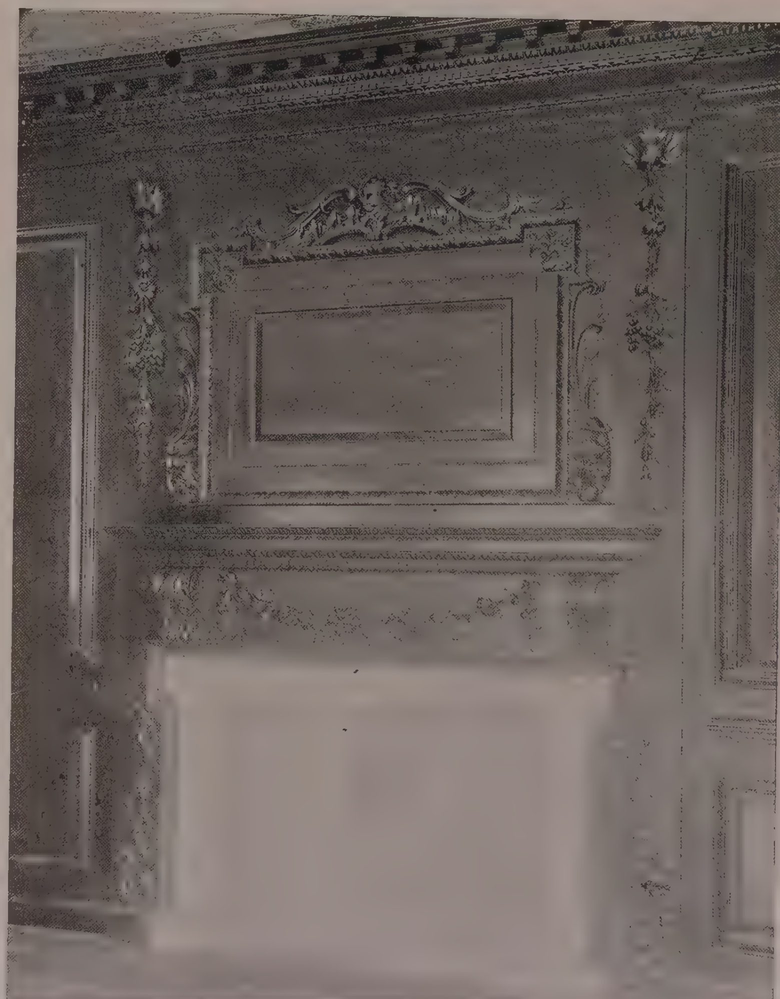
Ordinary fireplace flues should be 8 by 12 inches inside, also range and heater flues. The very large heater may require a 12 x 12-inch flue; the manufacturer of the heater will know this. The flue should extend directly from the centre of the fireplace, any change of direction to be made with gradual slant. Some claim that the round flue will draw better than the square one, which may well be, as the ascending heat takes a slightly spiral course. A 10-inch round flue is the ordinary size, while the large fireplace for cordwood should have a flue 12 inches

in diameter. The round flue should be put together like drainpipe, with a collar joint, and carefully cemented. An 8 x 8-inch square flue may answer for a very small chamber stove or the like, but it is unfit for anything else. Insist on using an accepted make of flue lining. Every fireplace, range and heater should have a separate flue.

Parlor mantel at Jamaica Plain, Mass. This is a fine example of elaborate modern Colonial. The painted panel makes a good central spot in the composition

The height of the ordinary fireplace should not exceed 25 to 26 inches. An excess of this allows cold air to pass up the chimney, as the opening does not heat readily above this height. The cold air in passing up the chimney will check the draught; such as comes down will rebound from the flat shelf back of the throat. What chance is there for good results under such conditions? The size of a fireplace for the burning of cordwood should be 4′ 6″ wide and 3′ to 3′ 6″ high. The depth of the ordinary fireplace is from 14 to 16 inches; of larger sizes from 18 to 26 inches. The throat of the fireplace should be directly over its centre, and should be made about one-eighth the area of the fireplace opening. Under ordinary circumstances this opening is too large, but an iron plate resting on the aforesaid shelf serves as a damper, and can be drawn forward by means of a poker so as to reduce the opening. Some forms of dampers are made to be controlled from the outside. The excess opening gives a leeway for days of bad draught. The fireplace should be lined with fire brick, laid with close joints or an iron lining, as may be preferred. The straight-headed fireplace should be supported by iron bars.

The fireplace facing can be of stone, brick or tile, as desired, and show an 8-inch or, better, a 12-inch face clear of the woodwork. There should be an iron cover to the ash dump provided at the back of the fireplace which connects with the ash pit in the cellar. This ash pit should extend to the first floor, and should have a 12 x 16-inch iron door with frames (in cellar), built into the chimney during its laying up. Thus the ashes can be dumped into the pit, which is cleaned out when necessary.



Old mantel from the Lee House, Marblehead. An interesting and effective treatment, with a touch of French in its design

The hearth is built on a trimmer arch which extends from 20 to 24 inches from the chimney breast to the "skew back" attached to the header beam. Two inches of concrete are laid thereon and brought to a level, on which rests the tile or brick hearth. As the province of the "skew back" is to keep the trimmer arch from falling when the header shrinks, it should not be omitted. The "tail beams" or short floor timbers which butt against the "header" between the two "trimmer" or side beams, are usually tenoned into the header, and further supported by an iron stirrup carried under them and turned over the header beam.

As fire spreads readily through the flues made by the hollow partitions, it is absolutely necessary that such flues be cut off by the insertion of some non-combustible material. In brick walls courses of brick between the flooring and plastering are projected from the wall face, so that fire cannot pass up the flues between the furring and the wall. A rough stone wall should be lined with brick

and treated in like manner, or if the studs be set against the rough stonework a stop of bricks and mortar should be inserted at the floor level to shut off the flue.

In a wooden outside wall the space from the foundation wall to the under side of the rough floor boarding, and from the inner face of the foundation wall to the outside boarding, should be filled in solid with brick laid in mortar mixed with plaster of paris. Also between the studs above the flooring three or more courses of brick should be laid in like manner, to extend above the upper plaster ground.

A well-tied fireplace motive, entirely out of the room proper. The old fire frame could well be used in a treatment of this sort

In the inner partitions on the first floor bricks and mortar should be laid on the floor joist, its full width, to the height of the under side of the rough flooring, and three or more courses above it between the studs to a height above the plaster ground.

On floors above the first brick and mortar should be laid on all partition heads to extend to above the plaster ground. Two courses of brick and mortar should be laid on top of all partition bridging to the full width of the partition. The space between the plate and the under surface of roof boarding should be filled in solid with brick and mortar to the full width of the partition.

Where a partition is set to extend only one story, independent of partitions above and below, the space from the footing to a height above the plaster ground should be filled with brick and mortar; also from the partition head to the under side of the floor boarding.

Where the walls of attic rooms are furred in from the line of the outer wall, one course of brick and mortar should extend from the partition head to the under side of the roof boarding. The hollow space occasioned by the furring out

of the chimney breast should be carefully looked to. Before setting the furring the ceiling should be lathed with metal lathing and rough plastered from the chimney outward as far as the breast will extend. After the furring studs have been set, two courses of brick and mortar should be laid upon the floor space thus enclosed and on the partition footing. Brick and mortar stops should also be inserted on the partition head to the under side of the flooring.

An old Salem mantel of simple, direct design. It is to be regretted that the common end of the old fireplace is to be harnessed to a stove

The wooden partition about the staircases, and such rooms as contain staircases, should be filled solid with brick and mortar from the first-floor beams up. The said beams should be properly supported in the cellar to carry this extra weight, and should be covered with metal lathing and plastered, so as not to leave any exposed surfaces. If the partition should not have a bearing or support from the cellar up, or be built about the stairs and upon the stringers, two courses of brick and mortar, extending horizontally on cross bindings at intervals of not less than 3 feet, beside the usual number of courses at the foot and head of the partition, should be used. Provision should be made in the framing to carry this extra weight. The space between the stringers at intervals of 3 feet should be filled solid with mortar mixed with plaster of paris. Wherever the stringers set on the floor or landing in such a way as to offer a bearing, this space could be filled to the limit with bricks and mortar.

It is always best in the planning of the staircase motive to have the connection continuous from cellar to attic. This arrangement admits of cutting off by double (or single) doors on each story, so that the stair well becomes, with proper fireproofing, practically an independent tower. If this is done, cellar stairs should

be included in the motive, and should be enclosed in a brick wall, with a fireproof door opening into the cellar and an exit into the open air. An alternative is shown in Fig. 23. This will take a little more room than the ordinary effort, but in a large outlay, where it would add materially to the general safety, the extra room would not be missed. It consists of two adjoining and practically independent wells, connected only by fireproof doors. The staircases alternate from one well to the other on the successive stories, and in this way cut off one floor from another. The fireproof door mentioned should be of the pattern described under that head.

Back plastering is applied to the inside of the outside boarding in a wooden wall. The best method is to furr out with lath placed in the angles formed by the studs and boarding, and lath and rough plaster on this. Thus a clinch is secured for the plastering. This should all be done after the laying of brick fire stops.

Metal lathing should be used in preference to wood, especially on the cellar ceiling, chimney breasts, the under side of stairs and about the staircase. If applied to wood furring, it should be held in place by staples. Metal lathing should also be used wherever a furnace pipe or other heating pipes pass through the partition.

Doors made of white pine and covered with tin on both sides, over which veneering is applied, are almost fireproof. The door frame should be covered in like manner. The above will stand more than the iron door. For rougher work a door covered with tin, without the veneering, will answer.

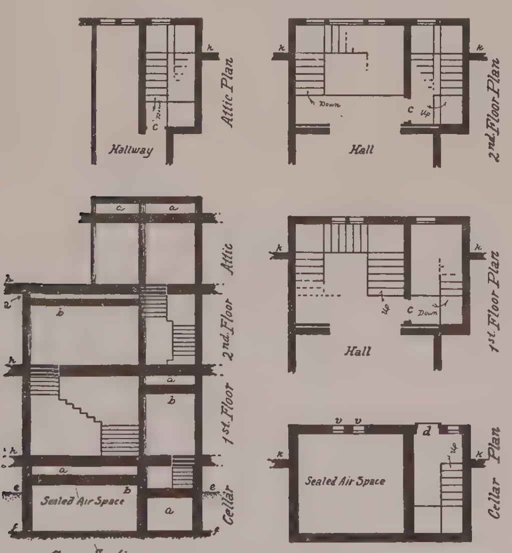


Fig. 23. Showing a fireproof staircase, which utilises two disconnected wells

a. Air space
b. False ceiling
c. Fireproof door
d. Exit door
e. Ground level
f. Cellar bottom
h. Floor level
k. Line of house
v. Grated vent

In addition to the usual fire stop in wooden walls, the danger from the furnace is further reduced as follows: When furnace pipes pass through partitions they should be made double, with a ½-inch air space, and the adjoining studs should be protected by tin set on furrings upon it. The studs should be at least 3 inches from the pipe. All hot-air pipes should be covered with a wrapping of ¼-inch asbestos to a point fully 15 feet from the furnace. The space about the double pipe can be filled with mortar or plaster of paris to good advantage. One register (perhaps that in the hall) should be fastened open so that it cannot be closed. This is an infallible gauge on the furnace. The cold-air box should be constructed entirely of galvanised iron, and so arranged that when the cold air is cut off the supply will come from the cellar. The inlet for cold air should supply a sufficient amount of air at the top of the furnace,

between cover of the hot-air chamber and cover of the furnace, that the ceiling above may not be overheated. A galvanised-iron shield, 6 inches larger than the diameter of the heater, should be suspended from the ceiling above the heater, leaving a sufficient air space between it and the ceiling. Never use other than a metal ash can; wood is too dangerous. Always keep matches in fireproof boxes with cover.


Old fireplace and accessories at Bull Run, N. Y. Photograph by Julian Dimock

Shingle roofs laid in mortar, though expensive, make a fire-resisting surface where it is often sorely needed. If ever an absolutely fireproof mixture is produced, the place for it above all others is on the shingle roof.

Gutters should be either metal or metal lined; many fires are started from burning firebrands lodging in them after rolling off the roof. For the above reasons slate is preferable to shingle, and metal gutters to those of wood.

All wooden structures should have stone or brick underpinning at least 12 inches from the ground, and no woodwork should come below that height unless otherwise properly protected from the possibility of fire from burning grass. Openings under piazzas and porches for lattice work should not be made nearer to the ground than 12 inches, and the lower step and step buttresses are best constructed of non-combustible material.

A flagging of brick, stone or composition should extend fully 16 inches from the wall of the cellar bulkhead. The reason for the above precaution is that mischievous boys and careless workmen often start serious fires while burning out grass, and it is well to forstall this as far as possible.

Fireproof paper should be laid between all under and upper floors, between the outside boarding and sheathing of all vertical wooden walls, and between roof shingles and roof boards. The ordinary floor deafening, which is usually composed of cement, sand and cinders, makes an excellent reinforcement to the fireproof paper in floor construction.

One length of fire hose placed on each floor, including the cellar and attic, so as to cover the entire area, is advised. It should be in an open hall way, preferably near the stairway, and should always be connected and ready for use. It should be located near a night light so that it can be easily found in the dark, and

it need not be an unsightly feature if planned for in the first place. The globe might be red, with "Fire Hose" ground in it. This is essential, as it might be a guest who would discover the fire. A 2-inch standpipe from the main service or, in the extreme, the attic tank will supply these. The ordinary pails of water in the cellar kitchen and attic are handy and effective. If the attic tank be employed, a length of hose may be handy for attachment to the main that supplies it.

A most excellent rendering, influenced by the styles of Louis XV. and XVI.

The above precautions are important. They are always ready, and much time is saved. A fire checked in time may mean the saving of lives and money.

The question of whether or not the lightning rod is really useful or is an invitation to destruction has not as yet been definitely settled; even the best experts disagree. If used, they should be of copper, which is the best conductor, and they should be properly insulated and grounded deep enough to reach moist earth. The neglect to attend to these two points is probably the cause of the utter worthlessness, and even dangerous qualities, of most lightning rods. The ordinary metal gutter and conductor, if connected with points on the roof and the moist earth at the bottom, will be less ugly and fully as effective as the regular rod. Moisture is a great conductor of electricity; this fact should be remembered.

For the ordinary small and medium-sized country house, the precaution of a coil of knotted rope in each chamber or second-story room is most excellent and inexpensive. This rope should be made fast to the upper part of the wall near the most desirable window or, if possible, between two windows. A recess about 16 inches high can be made between the studding, and the rope secured to a large screw eye inserted firmly in the top. A picture hinged at the top will cover the coil within the recess, and a large silk cord securely fastened to the end of the rope may be allowed to hang in full view below it. If a tassel having a metal ring engraved with "Fire Rope" be attached to the end of the cord, the unfamiliar guest will soon understand its meaning, even if not told. This contrivance is easily found in the dark, and as easily pulled from the recess. If small children are about it may be advisable to shorten the cord.

Mantel at Fairhaven, Mass. This design follows closely the better motives of the old English woodwork. Charles Brigham, architect.

In larger houses, in addition to the above, it may be deemed advisable to have a regular fire escape. Fig. 24 shows the best method, which is far from being an ugly one. It is a staircase tower of brick (stone-faced if in a stone house) which has no connection with the house other than by the several balconies at each story above the first. The exits from the house to the balconies should

be off a common passage and away from the general stairways. The balconies should not cross in front of other openings in the interval between the main exit and the tower, although they may extend beyond to include chambers if desired. The doors into the tower from the balconies should not have locks. The simple catch is sufficient, and the doors themselves should be armoured with heavy tin on both sides. The exit door at the bottom should likewise be fireproof and without a lock; a simple bolt on the inside is its best fastening; never use a key. It might be wise to provide a small sledge, which could be tied to the handle of the door by a 4-foot cord.

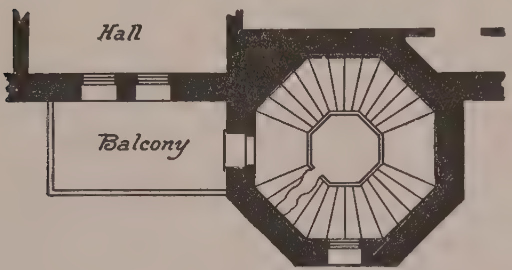


Fig. 24. Showing an effective form of fire escape

In case the door or bolt should stick this could be used. The door should swing outward. All windows in the tower should be on the side farthest from the building, small, and heavily glazed. It might not be a bad idea to screen the exit door with ivy or some other climbing growth. This will effectively hide it from the prying eye.

An alternative form of the above might be made by substituting a sliding pole for the stairs, after the manner of fire houses. The size of the tower would be much reduced, and even the women, after a trial trip, would have no trouble or hesitancy in using it.


Fireplace in a Bohemian cottage at Media, Pa. Bailey & Truscott, architects

An American development of the English Renaissance brickwork

A simple, big and home-like treatment of the Colonial

"Indian Harbor," Greenwich, Conn., the country house of Mr. E. C. Benedict. Carrère & Hastings, architects

A simple and well-lighted hall at Chestnut Hill, Mass.

CHAPTER VIII

Halls and Stairways

THE hall is the oldest room of the private dwelling. It is saturated with tradition and romance. We moderns strive for these in vain, forgetful of the origin and true purpose of the room. In the early feudal dwelling of northern Europe the hall was in reality the house itself, being used for entertainment, eating and sleeping in turn. It was large in size and all-important in the consideration of the building. As time went on other rooms were tacked on in a somewhat haphazard fashion—mere necessities, unstudied and unrelated. This general jumble of rooms was due partly to the fact that the feudal castle, being built on a rough and irregular site for purposes of defence, naturally communicated its lack of symmetry to the plan.

With the added rooms came the staircase, an equally unimportant necessity. This was spiral in form, to economise space, small in size and conveniently stowed away within the thickness of a wall, and later in turrets as well as walls. As it was deemed important, owing to the spirit of the times, that there should be several ways of traversing the motley array of rooms, these much begrudged must-be-hads were peppered into the general lay-out with an apparent abandon truly remarkable. The secret staircase of romance, under guard of concealed buttons and sliding panels, had its beginning in the rugged existence of this period. This belittlement of the staircase continued with the

Gothic style, and extended even into the Renaissance. In fact, with the Germans and French this latter style was for a long period simply an application of classic detail to the old lines and arrangements. Later, they learned from the Italians the possibilities and true importance of the staircase and profited accordingly, but it never entirely lost the clearly defined earmarks of feudalism.

In Italy the existing conditions served to bring about far different results. Her walled towns made the castellated building of the North unnecessary. Being the birthplace of the simple and regular plan, the importance of the stairway as a decorative feature was soon recognised and its true relation to the house and hall established.

Therefore the tortuous, winding staircase was early abandoned for other less secret communications, and the stairway became a feature of the design. The principal forms used were that of the straight staircase between two flanking walls and that which had one landing and a half turn in its flight. This latter form admitted of a continuous motive from the bottom to the top of the building, and galleries on the second story and above, which occupied about the same space and held the same relation to the apartments of these stories as the general hall below did to the first-floor plan. These two forms were also those used by the English in their work following the feudal period.

As has been previously stated, the northern staircase was thrown in without regard to the hall. One was more likely to find oneself in the privacy of a lady's chamber or hanging over the edge of a cliff than in any close relation to the room of many uses. Hence the guest who wandered at night was very apt to meet with trouble, if not positive danger to life and limb. With the Italians, on the contrary, the staircase often started from the entrance way, thus being easily accessible. The English outlay was somewhat more complicated. In the Gothic houses the entrance door opened directly into the hall. Frequently a screen was erected across the end of this room, which replaced in a measure the vestibule and at the same time afforded private passage to the staircase located at one end. For some reason or other the English architect, though at a later period borrowing extensively from the French, never quite

An upper stair-landing, showing the ramp and curve of the hand rail

understood the true value of the vestibule as did his neighbour across the channel; consequently the vestibule is seldom used in England. It will thus be seen that the staircase was cut off from the hall, and the hall itself more or less of a vestibule, as far as use is concerned.

With the Colonial the vestibule was still omitted, after the manner of its model, while the staircase was condensed into, and became a feature of, the hall. This was probably due to the general simplification of the plan and to an effort to save space.

In the construction of the Italian staircase, marble was the chief material employed. It was used for the rails and balusters as well as the stairs proper. The French had a weakness for the iron rail and baluster, in which material some very beautiful work was executed. The English, though using both marble and iron in a measure, had a decided tendency toward wood.


Old Colonial stairs at Jamaica Plain, Mass.

As the Italian marble staircase had its natural origin in the marble finish of its halls, so the English wooden effort was but the natural treatment where wooden ceilings and wall panelling were used. A mixture of these two would have been decidedly out of harmony.

There are several things to be considered in the planning of the hall and staircase of the American country house. First, it is safe to lay down as a fixed rule that every house should have a vestibule. This gives two doors between the house proper and the out-of-doors, which is quite

important. It is not conductive to a cheerful temper to have a chance visitor enter your hall and track clay or mud across your best rug, intermingled with a rivulet deposited by a wet umbrella. If the said vestibule exists, he will be freer from slander; and if a closet or recess for wet clothing, etc., is provided, his reception will be most cheerful. A small seat added will allow one to remove rubbers and overshoes with some degree of comfort, and a box under the same offers storage for this very necessary footgear when not in use. The vestibule further serves to do away with the cheerful matched-board storm porch which many otherwise sensible people allow to decorate the front of their houses. As has been previously stated, a glazed outside door or side lights are very serviceable if one cares whom he admits to his house. It is just as well that you are able to see without being seen.

Landing of Jamaica Plain stairs, showing details of post, balusters and rail

The hall proper, in conjunction with offshooting hallways, is used as a means of communication with the various rooms, and as such should be neither too large nor too small. The hall is really the heart of the house, and the hallways and stairs the arteries of the system. If the hall is to be used as a reception room, the staircase should be separated from it in such a manner that a person can readily traverse the rest of the system without being obliged to pass through it at all. The vestibule should likewise have separate connection with the kitchen, so that servants are not obliged to interrupt conversations, to their own annoyance as well as that of the host and the visitor. Where the hall is used as a living room (a return to first principles), it is doubly advisable that the above precautions be observed. As a matter of fact, the living-room hall is only fit for the free life of the shore or mountain summer home. It may be picturesque and attractive, but convenient—never! The servants will spread your affairs among the neighbours fast enough without coming into the living room after information, as becomes almost unavoidable. In a word, the publicity of the hall makes it unsuitable for a living room.

In the planning of the staircase it is best to see that it is well lighted and ventilated; also that it is not so much crowded upon itself as to make the handling of furniture next to an impossibility. With this in view, plenty of head room should always be given, and the landings be generous enough to admit of the turning of furniture upon it. Ample staircases even are apt to be scarred and

A Japanese rendering at Fall River, Mass. Cram, Wentworth & Goodhue, architects

battered unless you watch the expressman. If this is true of the carefully calculated scheme, then the true story of the careless effort is not for juvenile literature. The importance of the easy staircase is not to be underestimated; this one problem is the architect's usual stumbling block. A professional stair builder, with much architectural knowledge, has been known to plan a flight of attic stairs which were decent in every way but one—when you reached the top you had to crawl on hands and knees in order to get into the attic. This may be a trifling inconvenience for some, but most of us would object seriously.

All-important in the stair problem is the question of easy treads. Some few wise people prefer to have their sleeping rooms for constant use on the first floor and the excess on the second floor, knowing full well that they were never intended to climb stairs. To these we remove our hats with a mixture of respect and awe—awe because of the strength of character that would do a sensible thing in opposition to the general custom. Among the masses of country folks the first-floor bedroom has long been used and appreciated. Returning to the tread question: The usual rule for determining this is that the product of rise and tread shall equal 70. Hence, if the tread be 10 inches, the rise should be 7 inches; if the tread be 12 inches, the rise should be $5\frac{3}{4}$ inches. For ordinary stairs the 10-inch tread is as steep as should be made for comfort; if it be possible, the 12-inch tread should be used for front stairs.

Upper hallway of Fall River example, showing lighting agency

The common material for the stairs of our country houses is wood. As the Colonial and Elizabethan seem to be the prevailing styles, this is well. Hardwood treads, hand rails and newel posts are to be preferred, even if, as in the Colonial, the newel be painted, as are the risers, balusters and stringer board.

It is always well to have a separate staircase for the use of the servants, thus avoiding their use of the main staircase. In the small house, one way of condensing the stairway is to carry the back stairs to the main stairway landing, making the half flight above common to both. This should be done in such a manner that a person using the back

stairs cannot be seen from the hall below. In the case of the front stairs having a straight run this condensing cannot be done; it is only possible where a landing and half turn are made.

As to the treatment of vestibule, hall and staircase, there are certain things to be considered. We have already likened the hall to the heart; being such, it should be simple, strong and vigorous. The treatment of the vestibule should be severe; a mere civility to the knocker at the gate. The character of the hall relaxes a little—the courtesy of admittance. The staircase, a private thoroughfare, should suggest a passage, without attraction to destroy the effect of its true purpose. While not so severe as the hall, it can hardly, in good taste, come very close to the full relaxation of the living room.

A modern hall at Hingham, Mass.

On the above basis of relationship we will, as already suggested, make the vestibule simple and severe. The marble or simple tile or mosaic floor is appropriate for this, with forceful doors and little if any decoration.

The hall floor may be paved with tile, marble or mosaic of a character less severe than the vestibule. If hardwood is used, a simple, vigorous border would be in keeping and the wooden panelled dado with panelled stucco walls (provided the walls are not entirely of wood) would carry out well the general feeling of the design. Stucco walls call for a stucco ceiling, or perhaps a beamed ceiling with stucco panels. Beams thus used should have some apparent means of support from the floor, as suggested by the pilaster. In the case of the wooden walls the beamed or panelled ceiling seems imperative. The embellishment should, however, be simple and devoid of flourish. Such rich touches as are introduced should be carefully studied, that they may not destroy the dignity to which the room is entitled. Where the marble floor is used, the base should be of marble to harmonise. Whatever is done with the room in the way of finish, its true purpose should never be lost sight of.

Some claim that the fireplace should not be used as a decorative feature of the hall. From the point of view of the purist and the true intention of the

room, this is undoubtedly so. Nevertheless there is a decided tendency toward its use in this country. The trouble lies in the fact that it is generally made too "pretty," the chief fault with all our halls. We have spent much money and elaborated upon the old Colonial models, but it seems as if much of this were done very unwisely. If the fireplace be used at all it should be simple and severe in design, carrying with it a distinct feeling of strong repose and dignity, commanding respect rather than offering fellowship. A largeness of scale will help to effect this; thus a 6-foot opening is to be preferred to one of smaller width.

An example at Cambridge, Mass., showing a simple ironwork and hall seat. When the hall is used as a reception room the seat is an important consideration, and its location so as to be handy and yet not under foot is not always an easy problem. The above treatment is unique and certainly successful and seems to be handy to the front door, which is important

The great trouble with our staircases is, as in the case of the hall, a meaningless smallness of scale approaching often to insignificance. It is not the chamber, in which the bare foot and the rounded turn of the shoulder suggest like softness or luxurious repose, but the shodden foot and the movement of traffic. In other words, the staircase is not asleep, but wide awake to its own importance. Of course it is allowable to make the details a little richer than those of the hall, but any leaning toward minuteness is very much in the wrong direction. The importance of easy stairs has already been touched upon—the one thing our architects have

A simple staircase well adapted to an unpretentious house

seemed to grasp. They frequently bump your head or blockade your furniture in the carrying out of some freak effect, but their eye to the rise and tread is generally praiseworthy.

Old stairway at Carters Grove, Va. The broad hospitality of the Colonial South is here suggested

It is unfortunate that the most wise and appropriate efforts in the direction of stair rails and posts should be the most dangerous for children. A change must be made, but it should be effected largely on the children, and not on the aforesaid rails and posts. In order to protect the venturesome youngsters from a headlong fall into space, with a probable denting of the floor below, landing and gallery rails should be at least 3 feet 6 inches from the flooring. It is even better that they be made 4 feet high. Care should be taken to see that the stair rail fits and is comfortable to the hand; an awkward rail is a constant and unpleasant reminder of the one who is responsible for it.

For the general use of the American household, stairs are best made of wood. Marble may be well enough for a public building, but such are hard and unsympathetic for every-day home use, and of course with them the stair runner is out of the question. Of whatever material the stairs are made, it should be continued throughout the flight; marble stairs with wooden landings are very poor in design and taste.

The staircase, if disconnected from the hall for private passage, should have ample floor space at the foot of the flight to allow of an uncramped passage between the arch or screen which divides it from the hall. Saving space in this direction is false economy, and there is always a feeling of being crowded.

In the furnishing and embellishing of the vestibule, hall and staircase, the same rules should be followed as those which govern their construction. The vestibule requires no furniture or embellishment other than perhaps a very simple seat and a medium-sized mirror. Of course the usual door mat should be considered, and this should be strong and firm. It is better that it should be let into the floor so that it be well below the door swing, and further, to keep it from sliding when used. Otherwise, if neighbour Jones is particularly strong in his feet, you may be obliged to nail it down, which is awkward.

A large rug of strong, subdued colour should cover the hall floor, leaving an ample margin around it. If a pattern is used, it should be simple, strong, and not too contrasting in colour. The stair runner should be plain; if a border is used, it should be a very simple lateral stripe. Any attempt at pattern in the hall runner is grotesque when in place, and disturbing in the extreme. Most of them are designed with a pattern showing the want of foresight in someone, whether it be the manufacturer, designer or consumer.

The walls of the hall are well adapted for the hanging of tapestries or for strong, low-toned decorations. If pictures are used, they should be few and of good size; the print has no place in the hall. Statuary is perhaps better here than in any other of the ordinary rooms; it can be set in niches or on pedestals, although the niche is preferable. Often the staircase landing offers an opportunity in this direction, but it should not interfere with the passageway. The walls of the staircase should be fairly simple; tapestry or wall decorations may be used, but, as a rule, the picture is out of place. The dado should follow up the stairway at the height of and conforming with the stair rail. Whatever the colour scheme of the hall and staircase, it should always be neutral and not too delicate. This colour scheme will wear the year around, unchanged. Do not use too bright colours for the walls, ceiling and floor of hall; the rug and door hangings are the only things which could be warmer in tone than these, and even they but slightly.

An Elizabethan treatment—a distinctive style of wood. Charles Brigham, architect

For lighting purposes a lantern is the best medium. It is adapted equally well to the vestibule, hall and staircase. The light, however, should in most cases be slightly subdued, in order to carry out the general effect. Sconces can be used in some cases independently, or supplementary to the lantern, provided the room be large.

There should be no furniture on the stair landings. The tall clock is very frequently placed here, but if it interferes with the traffic it should go.

The hall is no place for stuffed furniture. Straight-backed chairs and settles are to be preferred, those of the Elizabethan period being excellent. If by chance you are tempted to put a rocker in your hall, hasten to cut it into firewood with an axe; it is much better so than in the hall. This room is surely not the place for solid comfort and lounging, and such furniture as embellishes it should impress this fact strongly.

An old staircase at Alexandria, Va. The Southern Colonial is all that it has been painted, both in song and story

If one has designed a house in which all the rooms are in proper relation to each other, one may feel quite sure that such superhuman perfection of accomplishment cannot last. The best that one can do is not to lose consciousness of that ideal of harmony and fitness which, practically, can be approached only from afar.

As the construction of the stair is more or less intricate, it is not generally attempted by the ordinary carpenter, unless in very simple cases of straight runs. This kind of work is done by a specialist—the "stair-builder." The importance of calculating for easy treads, landings and ample head room has already been touched upon. There remains, however, a few hints on the various styles of stairs.

The straight run of stairs are very well if not used to span a high story. If very long, they should have a landing in the middle to obviate the possibility of one's falling the entire flight. In the case of steep stairs this precaution is very necessary. When one gets started in this direction there is a fair chance of getting a bump for every riser in the flight.

Where stairs turn upon themselves they should always be constructed with a well at least one step wide; a solid return makes an ugly job. Wherever it can be avoided winders should not be used, as they are of necessity very steep near their intersection with the post, about which point the stairs turn. If it be possible, it is better to put in the square landing, the only object in the winders being to save room in reducing the run.

A modern hall at Williamstown, Mass. A well managed design in every way. The whole scheme is simple, rich and effective, and the wall paper seems a part of the design.

Owing to the tendency toward the returned staircase, it is best that the stairs should be at least 3 feet wide. In the case of front stairs, 3 feet 6 inches to 4 feet is advisable, if the necessary room can be obtained. The landing or turn may be even wider to advantage.

Stairs are built on wooden stringers, generally made of 2-inch spruce (see Fig. 25). These stringers are ordinarily three in number, are notched to receive the raisers and treads, and are set on an incline from one floor to another. Where the width of the stairs exceeds 3 feet, four stringers should be used. The framing of the risers into the treads, as shown in the cut, is calculated to allow for the spring of the treads between the stringpieces, as well as the natural shrinkage of the risers. The treads should be at least 1 inch thick; $1\frac{1}{8}$ is stiffer and better.

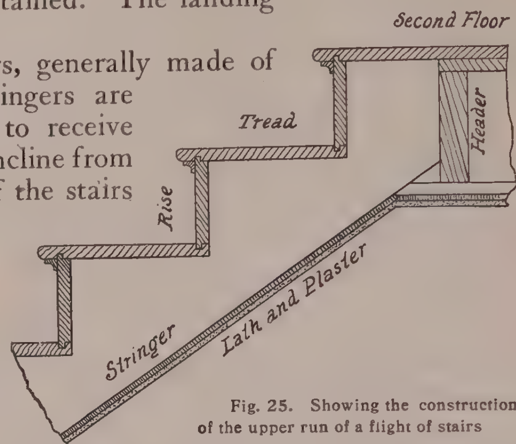


Fig. 25. Showing the construction of the upper run of a flight of stairs

Where the length of the stringers exceeds one-half the story, carriages should be affixed to them as reinforcements. These are simply pieces nailed to the stringers in such a manner as to drop below them, thus making a stronger stringpiece. Or, in other words, the carriage is a strip spliced to the stringer to gain depth, and hence strength. The carriage is especially valuable when we consider the weight of much of the furniture to be carted over the stairs. Stairs ordinarily run along the side of the partition, and in such cases the wall stringer is fastened to it, hence the carriages are only needed on the centre and outer stringpieces. The precautions to be taken against fire have been previously considered. As far as the construction of the stairs are concerned, they are merely supplementary. Briefly, they consist in stops of brick and mortar at intervals between the stringers, so as to stop any draught that might follow upward in this space, and also the use of wire lathing. The stops thus used should be supported on strips of plank cut in between the stringers. All stairways should be lathed and plastered on the under side of stringers, whether having a closet under them or not.

While the stairs are in process of construction it is well to keep a close watch over them to see that both plan and construction are what they should be. It is far easier to correct any mistake in the plan before the frame has been covered in, and, with the rough and temporary treads and rough framing, one can readily tell whether any change is necessary before this part of the work is carried further.

Den in the upper story of a house at Overbrook, Pa. Very suggestive of the medieval hall.
Wm. L. Price, architect

CHAPTER IX

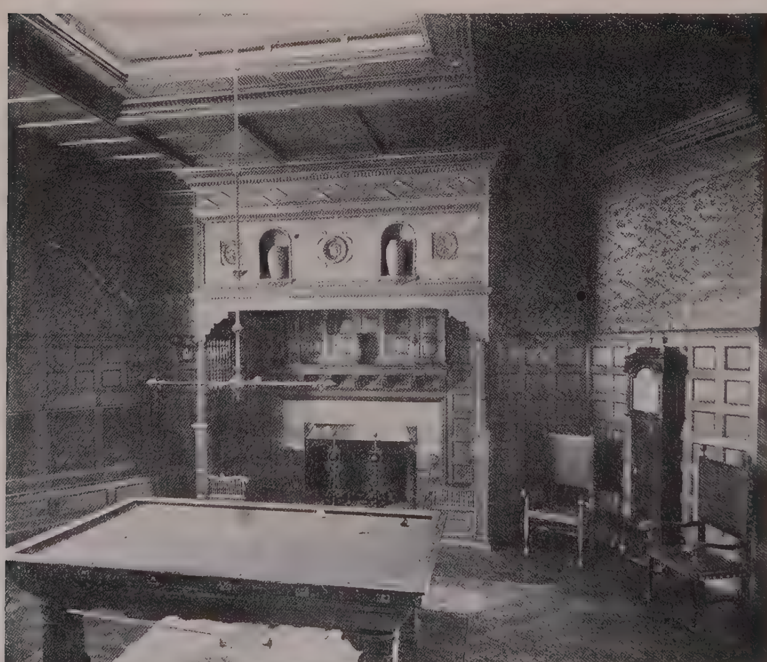
Living, and Other Rooms

OF THE evolutions of the various rooms of the modern country house from the feudal "hall," which are numerous and vary in different countries, it may be said that they arrived at the same destination in the course of time only to be shuffled up and misused by the modern American. The great trouble with our traveller abroad is his tendency to copy blindly whole plans, and whatever strikes his fancy in the details, without understanding their use or meaning. Hence the entirely unsuitable houses in which many otherwise rational folks are trying to live. Can anything be more ridiculous than to copy the elevated and railed-in "royal bed" of the Queen of France? Knowing its true intention, one would hesitate to do this, no matter how beautiful the thing might appear. To copy it would be to get laughed at for one's pains by those who know more of the subject than we do. The requirements and conditions of modern and ancient times are very dissimilar. When we have begun to understand this we have learned something of vast importance in the planning of the modern home.

Under the head of living rooms come the drawing room, library, smoking room or "den," morning room and reception room. Under gala rooms, the ballroom,

salon and music room. The chamber, boudoir and dressing room are to be considered in the bedroom suite. Let us take up these several rooms separately, as to their purpose, treatment, etc.

Living hall at Bayville, L. I. An honest and simple treatment on English lines. Babb, Cook & Willard, architects



A billiard room at Cambridge, Mass., lighted from the top

In France and England the drawing room was originally the bedchamber; later it was screened off from the sleeping room. The great publicity of the hall naturally suggested a place of retirement, and the bedchamber, being the only other thing available, was naturally used for this purpose. In France it seems to have been used for state visits and informal affairs, as well as for family use, while in England it first served as the "withdrawing room" for the female members of the family.

The Italian two-storied salon of the seventeenth century became at a later date subdivided into two rooms. One was used for entertainment and the other became the family apartment.

In the average American home the drawing room serves a twofold purpose, that of the general living room and a

room of entertainment, and frequently the drawing room is replaced by the sitting room and parlour; in which case the parlour is used for entertainment and the sitting room as a family room. This arrangement is a good one, provided there be no library to retire to in case all the members of the family are not engaged in the entertainment of the caller. Of late years it has become the custom to speak of the family room as the "living room," which term is surely appropriate. When Mrs. Jones calls to talk over the matter of church fairs or the rummage sale with the lady of the house, the man of the house is apt to retire to the kitchen, if no better place be provided, and hob-nob with the family cat. This is rough on the man. It is always better that the sitting room and the parlour should be connected by an arch, across which hangings can be used, than that one should relax into the dark, damp, ill-smelling parlour of youthful memory. The double sliding door can and should be used, but it is

A general living room at Cohasset. Mass. An example of good and simple design. John Lavelle, architect

Showing that it is possible to construct musical instruments in good taste

best that it should also be locked open, and only closed under extreme cases of necessity.

As the true purpose of the drawing room is one of constant use, it should be as comfortable as possible. The modern tendency is toward unsympathetic stiffness on the one hand and the museum on the other. It is evident that it should be neither of these. Although one is supposed to wipe one's feet before entering the drawing room, yet it should suggest comfort after one gets there. Stiff and uncomfortable furniture should be avoided, and in their place should be such pieces as most appeal to home comfort. Nor is the drawing room a place for gaudy demonstration. Quiet restfulness should be preserved; it should be remembered that whatsoever it contains must be lived with from day to day, and therefore chosen very carefully. Bric-à-brac should be used sparingly, as it has a tendency to accumulate and hence "clutter" the room.

A generous reading table, which can also be used for writing, makes a fitting centre motive for the room. A bookcase, even though the house contains a library, adds much to the home character and will be found a most useful bit of furniture. There is nothing more cheerful of a winter's evening than a good book, a good chair, a good light, and a good fire in the fireplace (even if we be slaves of the furnace).

As regards furniture, there is one sort that is always ugly no matter where it is used—the upholsterer's delight, stuffed inside and swelling out, like a fat boy full of dried apples. If you sit on it with firm determination you will rebound like a rubber ball. It has no lines or anatomy, and hence no claim to dignity, and as such should be avoided. There are, of course, good upholstered examples, but they are not of this sort.

Modern American architecture has evolved the reception room; its name signifies its purpose. Sometimes it is a room by itself, and sometimes it is embodied in the hall. The former method is the better, owing to the privacy thus obtained, although the latter saves some room and may often be managed successfully. When the outlay is large enough and the demand upon it is sufficient, the separate room is convenient indeed. One can receive the formal short call and transact small business in it. In size it should be medium, and should be provided with a centre table and writing desk, besides comfortable chairs, and, if room permits, a formal sofa. Its character should be stronger and somewhat richer than the drawing room; not a lounging room, but comfortable nevertheless.

In these times of the bound volume, which is made to come within the reach of the many, the library becomes almost a necessity to the book lover. About the middle of the seventeenth century the French had made the library a feature of the private dwelling. The cabinet continued to be the receptacle in which the books were kept, but the closed panelling had given way to glass and the bindings were thus exposed to view, as is the custom of to-day. Once upon a time, when the book was a costly and rare article and the binding more valuable and better known than the contents, as is often true of the modern volume, it was kept under lock and key and behind the awful presence of the retainer's axe. Since then the contents have become more familiar and the bindings consequently simpler and less expensive, although there are people who fill their libraries with

Parlour in the style of Louis XV. and XVI. An excellent example of rich and conscientious design and furnishing

binding, regardless of the contents. There is nothing against the handsome binding, although the simpler thing is the safer choice for ordinary use. Cheap and gaudy book designs are continually being made, with no other motive than to catch the eye of the public, and these help to destroy the decorative quality as well as the quiet of a bookcase. Can anything be more exasperating than trying to read Emerson under the glare and gesticulation of a red binding embraced by sundry whirls of purple and pink, which reaches out from its shelf and cannot be quieted?

The best form of bookcase, either in the movable or built-in type, is that which contains a cupboard at the bottom for folios and the like, with shelves above enclosed by glass doors. Of course it is always better to build in the bookcase when possible, as it then becomes a part of the decorative scheme, and not a rank outsider calculated to declare war on every line and motive of the room. It is well, in the case of a small library, not to build too much case at the start, although its extension should be planned for at that time. Long rows of unfilled shelves detract greatly from the restfulness of the room and give it a look of exceeding bareness. The space designed for future cases might be hung with unobstrusive hangings.

In the building of the bookcase it is well that the cupboard at the base be projected beyond the line of the book shelves above. This gives extra room in the cupboard; at the same time books can be laid on it temporarily while consulting the shelves; it may be made broad enough to sit on; or, if covered with baize or some other fabric, or even rubber, can be used as a step to reach the upper shelves. This last, however, is to be avoided if possible, not from a question of looks, but that it is always better to be able to reach easily the top shelf from the floor. Where it is absolutely necessary, however, it cannot be called a crime. The top of the bookcase can be used for busts, pottery or other art objects which seem to have a place in the room. The shelves should be of the fixed kind, grading from the larger at the bottom upward. This is better than the adjustable variety, inasmuch as they are always in line and do not destroy the symmetry of the room as do the others. A bookcase should always be protected by a glass door to save the contents from dust.

The most practical bookcase of to-day is the sectional pattern, in which each shelf comes separately and is complete in itself. Notwithstanding its utility it is a most ugly affair at the best. As the old patterns on Colonial lines are but a little less convenient and far handsomer, they are to be preferred when the small library makes the detached bookcase desirable. When all is said, however, the sectional type has a future, perhaps more promising than its past.

The decoration of the library should be quiet and subservient to the books and shelves, and the furniture comfortable and convenient. The library table should be large enough for all practical purposes, and that means size; it is generally much too small. As this table is used as a writing table, it should not become a catch-all for odds and ends; the ordinary bric-à-brac has no place in the library. It is a good idea to have an extra table for the disposal of current periodicals. They can be cared for in other ways, but some consideration must be given them.

The true smoking room, with its inviting divans and its hangings and

accessories of far-off Oriental tradition, has gradually evolved itself into the modern "den." There are those to whom the parent in all its richness and luxurious ease appeals more strongly than its more modern descendant. The Orient has given us much that is good in art, both in fabric and in metal work; the wonder is that it has given us so little bad.

The true Oriental smoking room is a delight, if it be carried out with some thought as to simplicity and taste. The most beautiful materials may be combined into a most hideous whole with an ease that is annoying. Its entire feeling should suggest the ease of the reclining Turk; get that effect— in any way, it does not matter how—but get it. A bit of Louis XV. furniture would kill the whole arrangement. A Colonial table will do the same thing. It is the one jarring note in any composition that is so easy to get and so hard to avoid. The style of architectural embellishment could hardly be Gothic; if not candidly Oriental it should be nothing at all. The room or passage adjoining this style should not be of a distinctly conflicting treatment, so as to ruin the effect of either. No arrangement that permits of two such conflicting styles being seen at the same time should be permitted; it is the very worst of bad taste.

Living room at Fall River, Mass., showing an effective and pleasing treatment of the Japanese. Cram, Wentworth & Goodhue, architects

A certain half effeminate quality in the Oriental smoking room has led some moderns to accept the rough, bold treatment of the den with satisfaction. This informal type is still a smoking room and answers the same general purpose of the Oriental original. The average American has lost, in a measure, perhaps, the old habit of the smoking jacket and slippers, much more of the long dressing gown. He prefers to sit with his chair tilted back and his feet on the table or mantel and talk shop, rather than to lose himself in the dreamland of Oriental laziness. As such things are not allowable in the drawing room he withdraws to the den, where "solid comfort" is possible.

As a general thing the den is apt to be the most homelike room in the house. There is really no good reason why this should be so, but perhaps it may be accounted for in the fact that the man is apt to select furniture with a view to its

use, and it is thus more likely to be comfortable than handsome. The woman, on the other hand, has a fairly good eye for the beautiful, with perhaps less of the practical. Some of the old furniture makes good furnishings for the den—the Windsor armchair, the old wing chair, the old English armchair with the high and slightly inclined back, and some models of the Italian chair. Among modern furniture the Morris chair is comfortable, although it is more likely to be of bad than good design, and the so-called "Mission," some of which is excellent, and more of which is unfit to put in the stable. This last-named style has one advantage in being very strong and unlikely to fall apart during its first introduction to the master of the house; its disadvantage is its weight, which often makes it an awkward thing to move.

Outside of comfortable chairs the den usually boasts of one good table and a writing desk. The general furnishings of the den are stronger than those used in the rest of the house, owing to the use to which they are likely to be subjected. Their selection depends largely on the individual, and uses to which it is to be put. Unnecessary bric-à-brac should be carefully avoided and the whole be kept simple and comfortable. There are those who lament the introduction of the roll-top desk into the house. As a matter of fact, it is not as handsome as most of the old desks one can mention, but it is surely better for business than anything else we can get. As the den often serves the purpose of a sort of home "office" it can well be used there, although it should only enter the library under protest, and never any other room. Some roll-top desks are fairly creditable (the plainer being better), and more of them are as bad as the mass of modern furniture that we are obliged to contend with.

"Den" in house at Salem, Mass. A delightful rendering by the pioneer designer of the Colonial revival. Arthur Little, architect

The billiard room is probably the invention of a woman, designed to keep her strolling spouse in the house evenings. It is often placed in the attic on account of space, and where one is obliged to climb flights of stairs to get to it. When once there one is reluctant to descend, and in consequence the guest chamber and nursery say things about it. The best place for the billiard room is on the ground floor, near the den or smoking room.

Not infrequently the den is made an alcove opening from it, and often, too, the billiard room is really the smoking room. This is, however, a matter of taste.

In the construction of the floor, deafening paper should be used—the regular floor deafening if possible—and the usual tracker laid around the table to deaden the sound may be of considerable value in this direction. Care should be exercised that ample cue room be allowed for on all sides of the table. It is rather awkward to be obliged to ram your guest in the nose while making a cross shot. The best way to manage the seats is to have them on a raised platform on both sides of the room. This platform should be one step high and from 3 to 4 feet wide, to accommodate permanent seats, settles or chairs, as the case may be. The front of this platform should be fully a cue length from the edge of the table. The windows should come well to the ceiling and have a good lighting area, as it is usually in the daytime, during bad weather, that the room is most used.

Parlour at Salem, Mass., Suggestive of the comfortable times of the old East India traders

With the side seats, a fireplace at one end and the entrance through the den at the other, the billiard room is about as simply and conveniently arranged as is possible. Cue racks can be placed on either side of the entrance or by the fireplace. These and other details are readily understood by the average player.

To our English cousins should be given the credit of the morning room. To those living much in the open air this rough-and-ready living room or informal drawing room is of great value. It can be used at all times of the day, by all of the family, and should have direct connection with the open air. It should be plainly and comfortably furnished with such furnishings as a little dirt will not harm. One is apt to track mud, and this should be considered. During wet weather the morning room becomes almost indispensable. Leather chairs are excellent owing to the ease with which they are cleaned, and they are usually strong as well, which is another advantage, as the morning room and its contents are apt to receive considerable hard usage. A fireplace should be installed, if such a thing be possible, owing to the comfort derived from it during wet weather. It

should always be in close touch with the billiard room and den, without infringing on other parts of the house, so that dirt may not be too freely distributed through the building. If its location be within easy reach of the dining room as well, the rainy-day suite (viz., morning room, dining room, den and billiard room) will be more complete. Books and papers are far from out of place in this room, as are also the card table, large table and writing desk or table.

Living room at Newburgh, N. Y. This room has direct connection with the loggia, and is more or less of a morning room

Billiard room at Jamaica Plain, Mass., showing an interesting wall treatment

Although the gala room is but little used in the ordinary American home, and only where a considerable amount of entertaining makes the ordinary outlay inadequate, yet it is best that a brief consideration be given it.

The salon, or company drawing room, is one of the subdivisions of the Italian salon, and being a guest room differs considerably from the ordinary family drawing room. In the first place, it should be of good size and roomy enough to accommodate the assembly. A large room may be so badly planned that

it is anything but roomy. As the scene of entertainment and festivity, its style and character should convey just such an impression and no other. Being also a formal room, it should be designed in a formal manner, and in a truly architectural style suited to its purpose. Perhaps the best style in which the feeling may be conveyed is that of Louis XV. or XVI., or, if one prefers, the lighter forms of the Italian. As the natural treatment of the Colonial for such purposes comes so close to the Italian, it is hardly worth while to note the differences, although they, of course, exist. The above styles are equally appropriate for all gala rooms, and it is better that all of the gala suite be in the same or similar styles so as to thoroughly harmonise.

An informal general living room in a summer home at West Gouldsboro, Me.

As the salon is not to be lived in, its treatment should be light in tone and perhaps somewhat rigorous in execution. The wall can be brilliantly decorated, as the style may suggest, but the introduction of pictures, prints, bric-à-brac and books, which is very much out of place, should not be attemped. Bronzes or marbles can be used with good effect, but such objects should be so disposed of as to avoid any chance of being overturned. The furniture should be light and strong (thus easily moved), and in the style of the room itself, and it should be so placed as to give ample passageway about the room. Such pieces as catch the feet and garments should be avoided; much damage is often done to limbs and expensive gowns, owing to poorly calculated furniture designs.

The ceiling of the salon offers a beautiful chance for mural decoration, undisturbed as it is by wall hangings and heavily hung pictures. The wall surface should not be encroached upon by the cabinet or other high pieces of furniture, lightness and airiness, which should be striven for, being the chief charm.

As has been before stated, the salon is not the place for family gatherings. It is an unsatisfactory substitute for the cheer of the fireside. Its only use has to do with formal gaiety, and hence it is seldom requisite in the American country house of ordinary pretension.

Reception room in offices of Messrs. Price & McLanahan, architects, Philadelphia, Pa. This has all the earmarks of a well-handled library. The furniture as well as the room was designed hy the above firm, while the carving, which is exceptional, was executed under their personal directions.

The ballroom has little claim upon the country house, although perhaps more than the salon. It is only fair, however, to give it some notice.

The same general treatment should be applied as to the salon; it should by all means look like a ballroom, and not like a chapel. It may be designed to run two stories, with a balcony or gallery at the second story for spectators. It can be treated with a vaulted ceiling, frescoes or mural decorations, but the decorations should be permanent in whatever style they be handled, as the wall picture and print have no place here. As the character of the room is rather more vigorous than that of the salon, the introduction of niches containing marbles, and tapestries and trophies may add much to the general effect, and the swing and movement of the dance, which effect the treatment of the room should carry out.

It is not a bad arrangement to have a platform, raised one step above the floor (after the manner suggested for the billiard room), on which permanent benches or sofas can be arranged. This device will obviate the possibility of stepping on the toes of those not dancing, and thus contribute to the general comfort of the ball. The loose chair is not a very desirable bit of furniture in a ballroom owing to its liability of being caught and overturned by the swinging skirt. It may perhaps answer with the platform arrangement, but it is best that it should not be set on the floor.

Where it is possible, as in the case of the high or two-story ballroom, the musicians' stand should be in a balcony, clear of the heads of the dancers. The old-fashioned pulpits of both the Continent and the Colonial period, with their decorative overhanging sounding boards, offer excellent suggestions for the music balcony of the ballroom.

The music room is more closely linked to the every-day life of the family than either the salon or the ballroom. Although distinctly a gala room in its primal intention, there is no reason why a moderate-sized music room should not become a part of the living suite. Thus the music room can be treated in two ways, that of the formal entertainer and that of the home entertainer. As a gala room its treatment follows on the lines of the ballroom as to general style, but in any case it should be devoid of heavy hangings or projecting wall ornaments liable to disturb or deaden the sound waves. It is also better for the same reason that the ceiling be domed or vaulted, rather than made flat. The walls offer an excellent chance for decoration. They should be light in tone, but not as vigorous or high in key as those of either the salon or ballroom. A too formal treatment places a sort of restraint on the quiet and ease of the room. Music suggests peace, attention and emotion; the formal is surely not in accord with this.

The music-room furniture should partake of the general sense of the room itself. Chairs, sofas or divans should be comfortable without being too luxurious. Upholstered or cushioned furniture is preferable to wood; music suggests relaxation, and one cannot relax into a wooden chair. If you are sceptical as to this, try it. The early pianos were considered in the light of furniture, and, as such, attention was given to their design. The modern article is a disgrace, generally speaking, as far as looks are concerned. There is no excuse for the manufacturer, as the public would be more than glad to get a decent-looking instrument, even at the expense of a slight sacrifice in tone. These designs have been so bad that

many who can afford it have had special cases designed by able furniture designers and architects, and naturally these have been applied to the "grand" type. Within the last few years some of the makers of upright pianos have turned out quite a number of very creditable designs, thus proving conclusively that the general form and the working parts need not be changed to effect this much-needed reform. The "grand," however, seems to hang just where it has been for years—an ugly, clumsy monstrosity—a jarring note wherever it goes. Let us hope that the day is not far distant when one can look upon the piano as a decorative feature in the home, and not as an eyesore tolerated only for the sake of the sweetness it contains.

Library at Montclair, N J., showing an excellent handling of horizontal lines.
Frank E. Wallis, architect

Corner in library at Kingston, N. Y. The recess to the right is occupied by the radiator.
Wilson Eyre, architect

The bedchamber was the first offshoot of the mediæval hall. When the female members of the household became tired of "herding" in the common room, they read the riot act to his lordship, and straightway the chamber was devised for their private use. As we have already seen, its privacy was at once appreciated and encroached

upon. At first it became the drawing room and bedroom in common, which again destroyed its privacy, until another concession was made, in its subdivision, by a screen, into two separate rooms. Even this arrangement failed to give the room the exclusiveness really required of it, but it was not until later that it became distinctly a sleeping room and nothing more.

A simple chamber showing an excellent, though rather strong treatment of the walls. Wm. and Walter Price, architects

Naturally the early bedchamber, being used as a family room, was decorated most elaborately. The bed itself was placed in an alcove, and heavy and rich hangings were used in abundance. This liberal use of draperies may have had a practical side in the difficulty of heating the high-studded rooms of the time. Be that as it may, it is now conceded that such an arrangement is anything but healthy, and it is also generally admitted that such fabric as is used in the sleeping room should be of the washable variety rather than of velvet or the like. Some of the Eastern cotton-print goods are excellent in design and stand washing readily.

A chamber alcove at Salem, Mass.; one of the first rendering of the Colonial revival. Arthur Little, architect

In feudal days people slept on the

floor, and were glad of the chance. Later a cord-strung frame, raised slightly from the floor, became the ancestor of the modern bedstead. After various natural changes the large four poster of the Renaissance, perched upon a dais or platform, and hung heavy with hangings, shone forth in its glory—a wonder of the cabinetmaker's and upholsterer's art. About the seventeenth century, England and her American colonies climbed into bed by the aid of a step-ladder. This stilted type, however, gave way to the more rational height of the present day.

The bedroom suite, usually comprising an ante-chamber, chamber, boudoir, dressing room and bathroom, is seldom used in this country. Unlimited means and room alone make such extensive arrangement possible. Where the suite is attempted at all, it usually comprises the chamber, dressing room and bath. That the suite is not more considered is perhaps from slightly differing conditions and customs rather than any real quarrel with the arrangement itself.

The bedchamber is more often badly than well planned. The average is a room of fair size with doors and windows, called a chamber. If you get the bedstead placed in any decent sort of shape you are lucky, and the finding of a fair lodging for the dresser, bureau, etc., is nothing short of miraculous. If you can then get into bed without crawling over everything else in the room your triumph is complete. As a matter of fact, the planning of openings and wall spaces in this room should be most carefully considered, and the disposal of the opening with a view to avoid a draught across the bed be deemed one of the most important features.

Dressing room at Cohasset, Mass., used also as a boudoir

As to the handling of the chamber floors, it is undoubtedly better that they be well covered with some substantial covering; the cheerless "cold floor" of unhappy memory is not a thing one cares to contemplate.

Why is it that a person with so much taste in the selection of the wall covering for the other rooms in the house falls so absolutely flat when it comes to the chamber? Who has not lain ill in bed and studied, puzzled and contrived until nearly ready to turn over and expire, and all because the crazy, self-evident wall paper made things and did things most extraordinary? The walls of the chamber should be extremely

simple—a delicate background for a few small pictures or prints. Nothing elaborate or disturbing should be tolerated. You may be luxurious if you wish, but let that luxury be quiet rather than demonstrative. The chamber is a place to sleep, and as such should suggest its purpose.

An unusual "den" at Osterville, Mass. The rugged character of this room is carried out by the shingle-covered walls

The modern boudoir, which properly forms a part of the bedroom suite, holds the same relation to the mistress of the house as does the den to the master. It is really her private sitting room or office, and sometimes, under the elasticity of modern planning, is located on the first floor, off the hall or drawing room. Thus used, it should contain a desk, sofa and several comfortable chairs.

Following the lead of its prototype, the boudoir may be decorated in a rich and elaborate manner, although there seems great danger of overdoing the thing. The general scale should be small and delicate, suggestive of feminine retirement. Small prints and art objects can well be used, although, as in all else, moderation should be observed. Japanese decoration and ornaments are rather suggestive for this room.

The dressing room fully defines its purpose in its name. Like the boudoir, it should be delicate in treatment, and at the same time much simpler. Its furniture, comprising a dressing table, chiffonier, mirror and the like, is best understood by those who are to use it, and is in detail largely a matter of taste. Here, as in all other cases where furniture is to be selected, it is advisable to procure pleasing designs. The old models, whether really old or copies, are by far the safer investment, as most modern designs are utterly worthless. This is not saying that there are no bad old designs; their proportion is far less, however, than in the modern effort.

The dressing room should have closet room enough to accommodate the wardrobe. It is awkward in the extreme to be obliged to crowd fabric which has a tendency to crush into a space altogether too small for it. Ample room in this case is worth having.

A winter dining room in the style of the Pompeian, at Saratoga, N. Y. Creditable as a work of art, but of doubtful practical value

CHAPTER X

The Dining Room and Kitchen and Their Relations

AS the dining room of the present day is a room in which meals are *served*, it answers no double purpose. In the early Middle Ages the nobility observed festivities in the hall. The feast was served on a long, movable table, the top of which was easily detached from the supports, and along which was placed lengthy benches, easily relegated to obscurity after the end of the meal. Thus, probably, our present-day table manners originated, although it is doubtless true that their infancy partook more or less of infantile uncertainty and freedom. We have not considered the Roman in this connection, as his views on these things were somewhat different, and also because he is suspected of being guiltless of a close adherence to table manners in our sense. He of the later Middle Ages dined, or rather consumed, his meals in the seclusion of his chamber. Prior to the setting aside of this room, he must, as we have already stated, have eaten in the hall altogether, with the dogs and the rest of the family, as this was substantially the whole house, and there was no alternative place unless it was the roof. At a later period, when the subdivision of rooms evolved the ante-chamber, it was one of these which served

the purposes of the dining room. Most of us are glad that animals have been excluded from the dining room, but there are still a few who, with the still-lingering tendencies of feudalism, continue the ancient practice from choice rather than necessity. There is a time and a place for everything, but it would seem as if that for dogs and cats were not at meal times and in the plate.

It was not until about the beginning of the eighteenth century that a room was set apart for the purpose of dining, and even then it was used for other things as well. The English realised early the advantages of a separate room, and the Elizabethan "dining parlour" became a feature of the sumptuous planning of the times. The French, on the other hand, were slow to adopt this new feature, and for a considerable period continued serving meals in rooms whose chief purpose was something entirely different.

The primitive Colonial ate in the kitchen, which was often of considerable size; he also used it largely as a living room. Even within the writer's recollection this common use of the kitchen was most forcibly exemplified in the paternal grandfather, whose antipathy to the rest of the rooms in the house was most marked. Born in 1800, in the stern wilderness of Maine, and living in the cold reality of those practical times, he tolerated the dining room from necessity only, and when dragged from his chosen retreat, the kitchen, to the family "sitting room," evinced stormy symptoms of restlessness. In the Colonial house of the more elaborate sort the use of the dining room as a sitting room was common.

A dining room at Montclair, N. J., showing Colonial influence. The end of the room is handled with skill. Frank E. Wallis, architect

It will be clearly seen from the foregoing that the exclusive dining room is a comparatively new thing. The demand for a separate room is due to differing conditions of living and of social intercourse. Largely owing to the growth and scope of modern inventions there is little that the past can offer except in the way of ornamental design, and perhaps a few scattered details. This is particularly true in the case of the kitchen, which has been revolutionised to the point af almost complete dissimilarity.

Although the banquet hall is seldom used in the modern house, and then only

in cases of large outlays where the owners entertain elaborately, still it is worthy of brief notice. Many of the state dining rooms of the eighteenth century were treated in the classic orders, with niches distributed between the pilasters containing statues. Often, too, one of the niches contained a marble or bronze fountain. These suggestions are good, but the style should not approach a cramped severity too closely.

Dining room at Wenonah, N. J. A well-managed design with unobtrusive service door. Wm. L. Price, architect

If niches and statuary are used, care should be exercised in the choice of subjects that are appropriate to the uses of the room. As the chief aim is to suggest fulness and plenty—fruit, flowers, trophies and emblems of the chase—the purity of the clear pool or spring and the vintage can be suggested in either flat mural decoration, the framed picture, or by sculpture in either low or high relief or the round. Pleasing mural panels representing the seasons and typifying the products of the soil can often be used to advantage. As the banquet hall comes in the same class as the ballroom and salon, it should have certain characteristics in common with them and yet have individuality enough to define clearly its purpose—the feast. Above all things, do not forget that the banquet hall is not a picture gallery, and that a close examination of minute details is hardly possible here, where everything counts from the vantage point of the table and under an artificial light. The family portrait has no place; it is not always inspiring to look at on such occasions, especially if the subject be a Puritanical preacher with his time-worn frown of disapproval.

An old-time kitchen, showing the brick oven. This example has the general living room air

As regards the floor, tile is evidently the best material, as it is cleanly and lasting. With this a large rug of smooth and close weave should be used. Draperies should be used sparingly, as their tendency to retain the odours of food is often annoying. Wherever the banquet hall is used there should be a "breakfast room" for family use. This room should be designed and furnished in a simple manner, so as to suggest the retirement of home privacy.

The real problem with which we have to deal is the dining room proper. This is the common form in more than 99 per cent. of all houses, from the simple cottage to the pretentious dwelling of the millionaire. They are large or small, according to the family requirements, some being even large enough to accommodate a considerable company. While the banquet hall is frequently one story and a half or two stories in height, with often a vaulted ceiling, the dining room is but a single story, or at least is treated as such.

A dining room at Bronxville, N. Y. This room has just enough in it to make it attractive. The wall covering is simple and effective

It is important that the size of all dining rooms should be considered in reference to the furniture; one that is too small is a continual source of annoyance. There is such a thing, however, as getting it too large. With the extension table pulled to its full length, there should be ample room to pass completely around it, back of the diners and free of the wall furniture. Do not try to economise to the extent of cramping; if you do, the waiter or waitress is likely to come to grief. Four feet is a fair space to allow; 5 is better. Never make it less than 3 feet, and that only at the ends of the table. It is seldom, perhaps, that the table will be extended to its limit, and on such occasions the 3-foot leeway may answer.

The decorations should be simple in character, not approaching the magnificence of the banquet hall. The same feeling should be borne in mind, however, in the choice of subjects. It has become a fad of late years to convert the dining room into a museum for old china. This is all very well, and in fact appropriate, provided it is not carried to excess. The china cabinet, buffet and upper half of the walls offer tempting fields for its disposal. It ought to be borne in mind, however, that it should never crowd out such pieces as are in actual use; as ornamentation pure and simple it should be relegated to the background. It is out of place on the sideboard, unless it be calculated for general or limited use. One rather good scheme of treatment is to panel the walls simply to the height of the doors, using as a cap a small shelf or ledge on which platters, pots,

brasses or coppers can be placed. This gives a fairly flat colour in the panelling, which contrasts well with the broken colour and spotting of the china and metal ware. This arrangement requires work to keep it clean, which fact should be understood at the start. It is best that the ceiling should be fairly light, in order that the room may not be too dingy. A simple beaming is often very effective in this case, helping to carry out the lines and colour of the wainscotting.

A simple dining room at Magnolia, Mass.

The floor can be either tile or hardwood, in which case a large and not too rough rug should be used under the table. Tile is preferable to marble, inasmuch as it is more lasting and offers better possibilities in the way of colour and design. Never use the fixed carpet in the dining room; the reasons for this caution are quite obvious.

The buffet is built into the wall, and is really a small closet with glass doors. The dictionary calls it a sideboard. Among architects, however, the former type is generally understood. It offers considerable opportunity for a touch of pleasing and often rich design, some of the old Colonial examples being interesting in the extreme. In modern treatment they frequently have connection with the service through the back of the lower shelf, which in such cases is not enclosed. Another form utilises the recesses formed on both sides of the chimney breast, thus making a balanced pair and an interesting treatment for one side of the room. If the chimney contains a good fireplace the effect is all the more pleasing.

Besides the usual access to the kitchen, the dining room naturally has a connection with the main part of the house. This connection, however, should be a closable one, as the odour of cooked food traverses the house fast enough through closed doors without any special invitation on the part of unclosable openings. It is possible in the planning to separate the dining room, kitchen and service from the rest of the house by a passage which, besides being ventilated at both sides, shall contain a radiator for winter use. This last, besides keeping up the temperature, will aid the ventilation materially (see Fig. 26). This same passage should be duplicated between the dining room and service and the kitchen. In this way the very objectionable and important question of odour will be settled as effectively as possible without making a separate building.

The English have handed down to us from the Elizabethan and Georgian periods some of the best types of dining-room furniture which are to be had. Some of the high, straight-backed chairs of the former are most excellent. The great stumbling block in modern dining room furniture is the table. Tables with fixed legs have their advantages in steadiness; those with adjustable members are correspondingly unsteady. The old "thousand leg" of the past is a work of art and a pleasure to the eye, but utterly impossible for a dining table. There are legs enough under a table, as a usual thing, without adding anything in the way of wooden ones, and the mix-up is often most annoying. Wherever the legs come on the outside edge of the table they are bound to be in the way; if a centre support be used, the spread of the legs or feet at the bottom is almost as bad as the first. While the central support is a step in the right direction, yet it does not insure rigidity, and is hence imperfect. Ugly as the extension table is, and despite its legs and lack of firmness, especially when extended, it is the best we have. Why has not some-one considered this problem from the standpoint of a fixed or built-in standard, combining extension features in such a way that the table will have good lines whether closed or extended? Such a solution would do away with those obstacles which get in the way of the feet, and would be a boon to the gastronomic world in general.

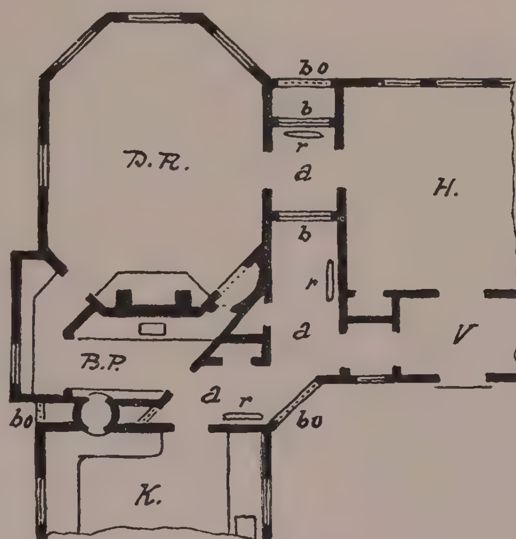


Fig. 26. Showing an isolated kitchen and dining room

a Passage
b. Window
bo. Screened opening
r. Radiator
D.R. Dining room
K. Kitchen
B.P. Butler's pantry
H. Hall
V. Vestibule

The wainscotting and the ceiling are noticeable and good. The old-time ancestral portrait is, however, decidedly out of place

It is a most unfortunate thing that, generally speaking, the kitchen and its relations to the dining room and the rest of the house are not more carefully studied than they are. Of course there are some few good examples, but one that is at all complete is a rarity. The early Colonial kitchen was a haphazard affair, frequently large, and, as already stated, used as a dining room and a sitting room in addition to its prime purpose.

Dining room at Jamaica Plain, Mass. The end treatment is highly interesting

The kitchen of to-day presents a unique and important problem. Where we once cooked in brick ovens or before the wood fire, we now have carefully designed coal and gas ranges. These are usually hideous in design, but meritorious in their working. In the planning, we should consider the uses of the kitchen, what it shall contain and where those things are to be placed. The cook, in preparing the food, stands in certain places and uses certain things, which should be within reach and thus govern the arrangement. Keep the kitchen as small as your fittings will allow without cramping. If the cook should be able to stand in the centre of the room and by revolving on her heels perform her duties, both time, space and the cook may be saved. The principal trouble with the average kitchen lies in the fact that there is an unlimited amount of travel involved; no thought is apparently given to the saving of steps. One can hardly blame cooks for not staying long in some kitchens; the wonder is that they show such patience as they do.

Ventilation plays an important part in kitchen planning. This room being a generator of heat and odour, it should have ample provision made to take care of these. A hood over the range with a vent into the chimney is an excellent provision for the disposal of these. If the kitchen flue can be made large enough to carry the ventilating duct in the form of a sheet-iron pipe, the actual working of the vent will be much benefited. As some heat is apt to find its way to the ceiling and above the line of the hood, a second vent may be made next to the ceiling in the chimney breast, or better, the flare of the hood may be confined to the depth of the floor above, making it practically out of the room. Kitchen

windows should be carried well to the ceiling to this end as well as for light, and if they can be placed on opposite sides of the room so much the better. Windows should be higher from the floor here than elsewhere, so as to be above the sink and tables. It is probably unnecessary to suggest that the usual hot-water tank should not be omitted. It should be of the best and of sufficient capacity, and to save floor space may be of the suspended type.

It is still the custom in England to use a table in the centre of the room. This is sometimes done in this country and is often necessary, the chief objection to it being in the fact that the centre is usually the darkest spot in the room, and, further, that one has to walk around it, a fact which makes it much in the way in a small kitchen.

The English and French have retained one good thing which we have unfortunately discarded—that of leaving the pots and other kitchen utensils exposed and open to the air. The advantages of this are evident: It gives these articles no chance to get musty or sour, as the air is an excellent purifier. Furthermore, if they all hang on the wall, they are more easily found when wanted than if hidden behind cupboard doors. Of course the cupboard has its place, but it is not necessary to put everything in it. The objection will at once be raised that such exposure invites dust; true, but is it not easily removed, and is not its cleanliness far superior to the half-cleaned article that is stowed away in the cupboard to sour? Of the two evils, is not this by far the least? Every vessel should be wiped out before using, after lying idle, even if it be clean.

It has been suggested by one writer that ranges vary in height, and that some of them are often too low for the average person to bend over. It is awkward to be obliged to stoop or to reach; such things should be considered. As cooks come in assorted sizes, the only way is to strike an average. If the lady of the house has much to do with this art, it is she that should be "fitted" to a stove. The loose step to overcome the difficulty would be so much in the way as to be almost as bad as the trouble itself.


Dining room at Winchester, Mass., showing an excellent wainscotting and china shelf

In connection with the range one naturally thinks of the fuel. It is not advisable to have a coal box in the kitchen. On account of the dust and dirt this fuel will not bear too much handling. It is better that several scuttles should be provided from which the contents can be fed direct to the stove. With the wood it is different. There should be a metal-lined kindling box, placed perhaps under one of the fixed wall shelves, which can be filled from outside the kitchen.


A dining room on the lines of the Elizabethan, at Montclair, N. J. The leaded glass and tapestry effect add greatly to the design


A fine simple design on Elizabethan lines, at Bayville, Long Island. The general details and the ceiling show a careful study. Babb, Cook & Willard, architects

At the present day the gas stove plays an important part in the culinary outfit. Where gas is within reach its installation should not be omitted. This invention has many advantages, chiefly in its saving of heat and its clean fuel. This makes it a great convenience, especially for the summer. When not in use it consumes nothing, and is as placid and unobtrusive as an old iron pot. The amount of heat is positive and easy to regulate. In this respect it is the superior of the coal range. There

are perhaps some few things that the latter will cook better, but the gas stove will bake "Boston beans," which seems a very good test of its efficiency.


A kitchen corner showing the disposition of coal and gas ranges

The best sink is, of course, the enamel or porcelain one; the soapstone is a close second, and for the kitchen and its heavy work the latter is safer. Although the galvanised iron is supposed to be superior to the plain iron, there seems to be considerable doubt on that point. The iron sink, if attended to and oiled occasionally, can be kept in very good order. Some who have used both declare in favour of this last, claiming that the galvanised sink involves constant care, owing to its great tendency to spot; nor is it entirely rust proof.

In the setting of the sink, the point where the legs set on the floor should be at least six inches behind the line of the front of the sink. This rule applies to cases where the cupboard is used underneath as well as all stationary counter shelves (see Fig. 27). The reason for this is obvious; the human foot projecting beyond the line of the leg would interfere were these two members made on the same line.

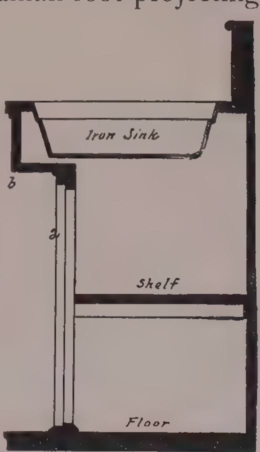


Fig. 27. Section through a kitchen sink

Counter shelves, sinks and the like should be of a convenient height for those using them. It is perhaps well that all counter shelves should be zinc covered, particularly those adjacent to the sink. Tile is even better than zinc for this purpose for the stationary type. A marble slab raised slightly above the shelf level is often a convenience not to be underestimated, especially in the pantry, where it may be used as a mixing slab. Often the swinging shelf is of advantage; but this should only be used where space will not allow a fixed shelf. Its great objection lies in the fact that, as an emergency shelf, it is usually down when one has both arms full and it is most wanted. That time is when the cook arrives from the cold closet laden with the making of a boiled dinner, and incidentally two scuttles of coal and a pie pumpkin, and unless she is more than commonly dexterous with her feet, her temper is apt to suffer.

The location of the ice box is frequently overlooked in the general arrangement.

It should not be in the kitchen, yet near it. Often it can be located in the pantry. In any case it should not back up against the chimney or any other hot place, and if it can be filled from the outside, or at least without going through the kitchen or pantry, it is a decided advantage. It makes little difference as to whether the chest be of the movable or the built-in sort; it is purely a matter of taste. The latter may be planned to suit any individual whim of the owner. The former, it may be added, can be isolated from the inroads of ants by placing the legs in tins of water.

Everything is simple and to the point. The two doors lead into the pantry and the china closet. The floor is laid in composition blocks

The relation of the cold closet to the kitchen is also important. It is best located at the foot of the cellar stairs, where it will save as many steps as possible; the help must be considered. Often much can be saved in the way of steps and the size of the refrigerator (which will not hold everything anyway) by the use of a cold box. This is not advisable as a window ornamentation. On the contrary, its best form is in the shape of a lift provided with shelves, lined with zinc and screened to keep out the roving freebooters of the insect kind. It is preferably located in the pantry and lowered from thence to the cold closet or some other specially built contrivance. If it seems desirable to connect it with a draught box, it is best that this should come below it so that the lift will not get the dust (see Fig. 28).

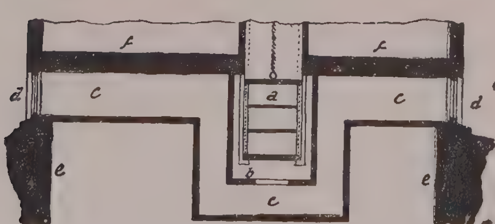


Fig. 28. Section through draught box and cooler
a. Cooler b. Case c. Draught box d. Window e. Foundation f. Floor

All the standing finish and hardware of the kitchen suite should be as simple as possible, that it may be cleaned with ease. The woodwork is best in the natural finish, and not done too light. The walls, if of plaster, are easier to take care of if painted; they would have to be painted anyway in the end, as the kitchen accumulates

dirt rapidly. The walls should be of a medium tone, and the ceiling, while lighter, considerably off the white.

The ordinary kitchen floor is laid in narrow strips of matched rift Georgia pine; this or some other hard wood makes a good flooring. Better than this, however, is the tile floor. The only objections to it are its non-yielding qualities, which are easily remedied by the use of several rubber mats which can be taken up separately and cleaned; or, what is equally effective, the cook can be shod with rubber heels. The interlocking rubber flooring is not bad either, although somewhat inferior to the tile from the standpoint of durability. The tile has one advantage over all other floor coverings which should recommend it for kitchen use—that of extreme cleanliness. In fact, where the question of expense is not too pressing, it should be used for floor, walls, and even ceilings. There is nothing better. For the walls and ceilings glazed tiles may be used, as they are more easily cleansed than the unglazed; they are too slippery for the floor, however.

The kitchen or pantry dresser, as commonly built, comprises a counter shelf, with a number of enclosed shelves above with glazed doors. Below the wide counter shelf is a cupboard for flour bin, drawers, etc. The accompanying cut (see Fig. 29) shows one form of construction. The upper case of shelves is supported at the ends by wooden brackets or by prolongations of the sides of the case. It is well that the ends either butt against the wall or be provided with a guard formed of the end brackets, to prevent dishes from taking a quick trip to the floor. If the width be considerable, iron brackets (g) are used in the interval. The front, or nose (h), of the counter shelf (st) projects beyond the cupboard door in the manner already suggested. The bin is made to swing on two metal pins (b), one on either side, from metal cups in the irons (k). This

This shows the exposure of the kitchen utensils, as is the custom in France

allows it to be readily tipped forward for use (o-o-o), and also admits of its withdrawal by aid of tracks in the irons (k), so that it can be easily cleansed. The handle in front (c) is to control its swing; the handles at the side (n) to remove it by. The pins (b) are set a little to the front of the centre so that the bin shall have a tendency to retain a normal upright position, even with a moderate inequality in the distribution of its contents. The cleat at back (d) prevents the pin from swinging too far forward. The strip at the front bottom angle (f) avoids an awkward corner from which to remove the contents. The cover at the top (e) prevents rodents from entering, should they succeed in gnawing through from the cellar. To complete this precaution the under side of the top cover and outside of the bin should be covered with zinc or tin.

A light and convenient kitchen—range, sink and dresser well placed

A kitchen dresser—simple and neat in design and thoroughly practical. The glazed doors make its utility greater

Kitchen chairs must be strong and simple, as they are subjected to all sorts of hard usage. The combination of chair and ladder, a somewhat recent device, will be found very useful in more ways than one.

The relation of the kitchen to the rest of the house is one of great importance. The whole thing should be a machine whose working parts are as near perfection as they can be made. Everything should be arranged to save steps and to avoid the spread of kitchen odours. The first step toward the disposal of this last lies

naturally in the ventilation of the kitchen, through the medium of the chimney; the second in checking its egress in any other direction, if possible, without

The feeling of simple comfort more than makes up for a few minor defects. The rug is an effective feature

smothering that more than valuable worthy, the cook. To this end there should be at least two doors between the kitchen and the rest of the house. As a matter of general utility, the back door should be easy of access and convenient to the cellar and refrigerator. The passage to the front door should be short, without making it necessary to traverse any principal room. As the back stairs make an excellent conductor for the carrying of kitchen odours to other parts of the house, they should be isolated as much as possible without being too much out of the way. In a locality where gas or electricity is not to be had, the lamp room is a useful and valuable adjunct of the kitchen suite, as it confines filling and cleaning of lamps to a fixed place.

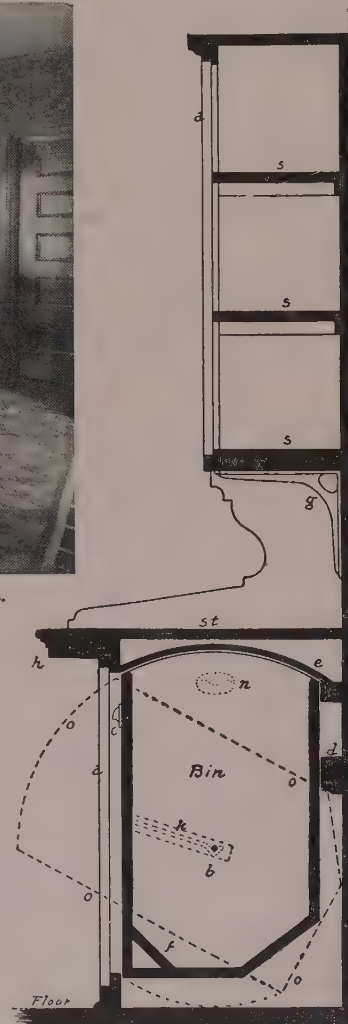


Fig. 29. Section through kitchen or pantry dresser

a. Door jamb
b. Pivot pin
c. Front handle
d. Cleat
e. Cover
g. Iron bracket
n. Side handles
o. Inclined bin
s. Shelf
st, Table shelf

To illustrate these foregoing relations, as well as the general kitchen arrangement, let us take for an example the accompanying plan (see Fig. 30). The kitchen, which has windows on either side, is fitted with two long counter shelves, one on each of the outside walls; thus these and the room are well lighted. In size it is 12½ feet from shelf to shelf and 12 feet from chimney breast to opposite wall. The range is of the set

type, and the chimney at the back is provided with an air space and vent to reduce the temperature of the side coming next the pantry and back entry. The gas range is set in a recess (which should be tile or zinc lined), and thus out of the way. Some might prefer that the two ranges be together. This could be done by shortening the counter shelf by the entry door and shoving the door toward the outer wall, or by increasing the width of the kitchen. There is a dresser (a) into

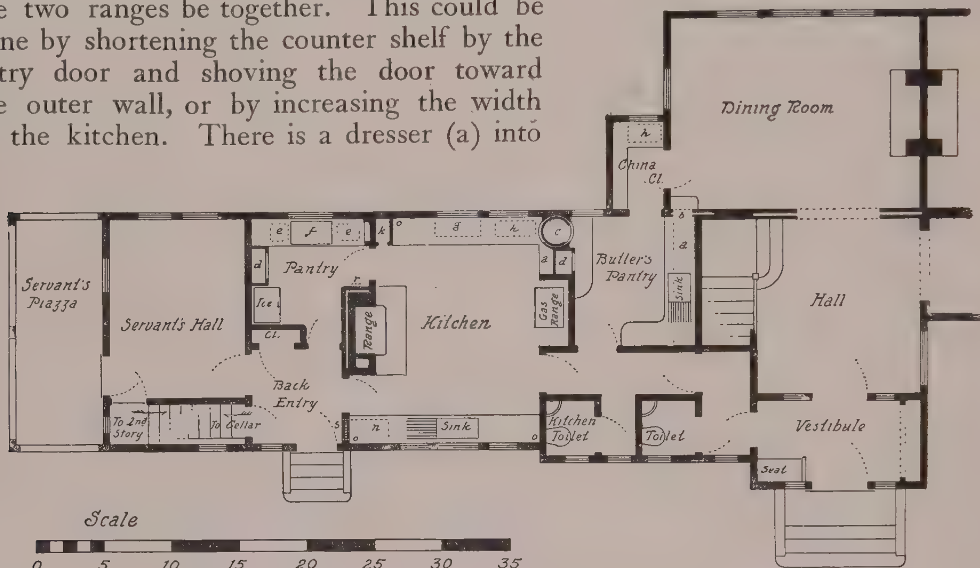


Fig. 30. Plan showing a good outlay of kitchen, dining room, service, etc.
a. Dresser b. Slide c. Service box d. Cold box e. Bin, under f. Marble slab g. Cooler, under h. Linen drawers, under k. Broom closet n. Wood box, under o. Wall space for pots and pans r. Coffee mill s. Wood box, door

which a service box (c) is built, connecting the kitchen and butler's pantry. This box, which has an opening in one side, revolves within a shell having an opening in either side; thus the food is delivered to the butler without an overdose of the kitchen odour coming in after it (see Fig. 31). A broom closet in the corner is near the range (k), and the wall space on either side of the corners (o-o-o) is available for the hanging of pots and pans, reasonably handy to the stove. At g is a cooling box under the counter shelf, for pies and the like, which receives air from the outside, and a case of drawers at h takes care of the kitchen linen. The wood box under the shelf (n) is filled from the back entry through a door (s).

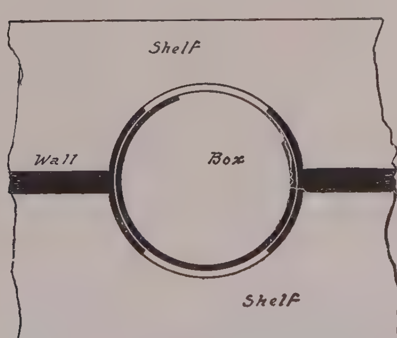


Fig. 31. Detail of a revolving service box

In the pantry there is a marble mixing slab (f) and two flour bins (e-e). The ice box is located here, where it is near both the kitchen and the back door. The fact that the pantry opens into the back hall allows of ventilation not conveniently obtainable otherwise. A cold box (d) which drops to the cellar is also provided for here.

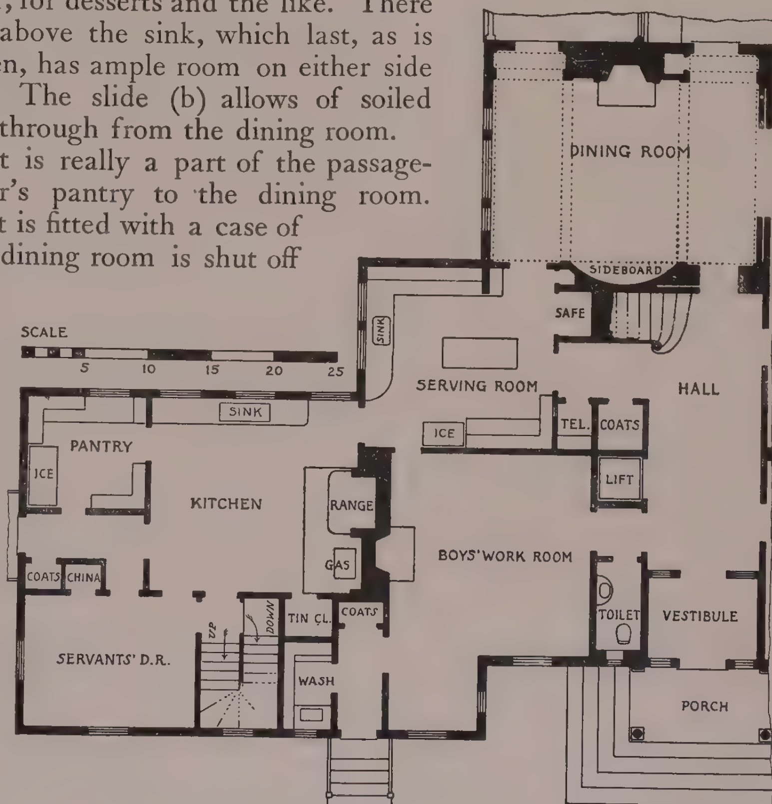
The cellar stairs are easily accessible from the kitchen, and admit of a

window for lighting. The back stairs, which open out of the servants' hall, while convenient enough, are shut off from the kitchen by three doors, which should cut off some of the onion and cabbage odour in its permeating ramble.

The butler's pantry is provided with a small cold box, on the lift order, for desserts and the like. There is also a dresser (a) above the sink, which last, as is the case in the kitchen, has ample room on either side of it to work with. The slide (b) allows of soiled dishes being passed through from the dining room.

The china closet is really a part of the passageway from the butler's pantry to the dining room. Beside the shelves, it is fitted with a case of linen drawers. The dining room is shut off from the kitchen by two doors besides the fly door in the china closet, which, having no striking piece, really does not count as a barrier to odour.

The front door is easy of access from the kitchen. The distance is short and there are three doors in the interval. Incidentally, the two toilets are conveniently located.

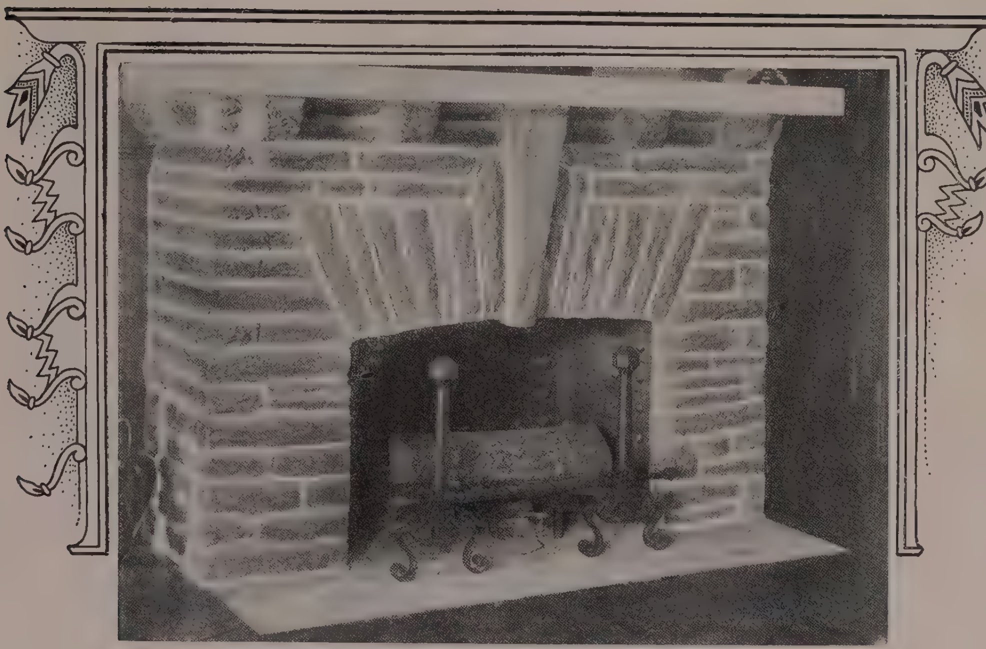


Kitchen and dining-room suite designed by Hartley Dennett, architect

We will not suppose that this is the only solution of the problem. There are others, some of which may be better. This one is good, and seems to cover the ground fairly well in the solution of the kitchen and service problems.

The example designed by Mr. Dennett, here shown, is excellent, and worthy of careful study; it seems to be the serious consideration of a serious problem.

House at Woodmere, Long Island, having a Germantown hood. The second story is covered with wide, old-fashioned split shingles. Cost about $10,000. Charles Barton Keen, architect



A fireplace of "half-rough" stone. David K. Boyd, architect

CHAPTER XI

Heating, Ventilation and Lighting

THE modern dwelling has evidently made a considerable stride forward since the days of the leopard skin and the cave habitation, but one cannot fail to see that it has lost something as well. Perhaps, after all, it is some features of the mode of living which are to be regretted rather than the domestic shelter itself. Primeval man evidently spent little of his time in his cave; his natural surroundings were the open air and the woods. His descendants, on the contrary, spend the greater part of their lives indoors, in overheated and unventilated edifices, and at the same time their children are sent to the hills to sleep in the open air, where the healing balm of nature shall restore to them the health seriously impaired under the false conditions of the modern home.

It will take no long-drawn argument to make the individual of ordinary intelligence understand that the outdoor life is the true life, and that of the dwelling house an artificial one. However, we have adopted the latter, and it is well for many reasons that we have. At the same time, the former should not be entirely lost sight of, and an effort should be made to remedy existing defects. This remedy lies naturally in the introduction into the latter of the best features of the former, under the most favourable circumstances. Naturally, too, this

Sun parlour in Japanese house at Fall River, Mass. Cram, Wentworth & Goodhue, architects

remedy must be artificial, and consequently the terms "Heating" and "Ventilation" at once claim our attention.

Lest there be some misunderstanding in regard to the matter, it is well to state here that the natural heat is that of the sun. The jackass, who seeks a shelter and sunny spot in his enclosure of a November day, knows this. Probably, too, nine out of every ten persons would guess rightly the first time, were the question put to them point blank. The jackass, poor chap, is, however, more keenly alive to the fact, it being the only heat he knows; while the ordinary individual, more fortunate, perhaps, knows more of stove ashes, registers and leaky steam valves.

We have mentioned the sun because it is its heat that must be replaced artificially for a certain portion of the year, and, further, because in some parts of the country the admission of its rays through glass may be found of much value for warming purposes. Hence the "sun parlour" may perform a most excellent office where the temperature, though slightly chilly, is not enough so to warrant the use of the heater.

Your physician will tell you not to sit in a room with the temperature below 62° F. Do not, then, jump at conclusions and run the glass up to 90° or more; this is overheating—a common fault in our modern houses. A comfortable heat is that of 70° F.; much warmer than this is not conducive to good health.

A New England sun parlour, formed by screening in the piazza. The full value of the sun parlor is hardly appreciated by the majority of home-builders. It is a decided addition to the country house in a temperate climate. E. A. P. Newcomb, architect

The open fireplace and its modifications, the fire frame and open grate, are not desirable heaters for a climate where the temperature runs below the freezing point. They are large consumers of fuel in proportion to the heat derived from them, at least three-quarters of that produced going up the chimney. They are, however, excellent to remove the chill of late fall and early spring, and the damp of any of the milder seasons.

Mr. Putnam, in his book "The Open Fireplace in All Ages," gives the result of tests of several styles of "ventilating" fireplaces which have been constructed with the idea of saving some of the lost heat. As the several variations are hardly in more than the experimental stage at present, they need not be considered seriously until results shall have proved their worth more definitely.

The old fire frame, owing to its radiating surface, is a better heater than the ordinary fireplace, and being usually of good design, is well worthy of consideration.

As a heater the stove is an improvment on the fireplace, and yet it is a question, after all, if it should be considered as a means of heat for the modern country house. The heat given off from it rises in a vertical column, diminishing rapidly in horizontal directions. The old phrase of "hugging the stove" is not far from the truth; you "hang" over it until one side is "done to a brown," and then revolve like a chicken on a spit to favour some other portion of your anatomy that is all but freezing.

Hanging vestibule lantern in the style of the Renaissance

Another point is its lack of beauty. Although the modern stove has improved in utility, it has lost correspondingly in grace of line since the days of those charming Tyrolese examples in tile. It is true that the applied

arts have recovered greatly in certain lines since the declining period of "wooden Gothic" churches, and yet a glance at the ordinary modern stove convinces anyone of passable taste that the disordered brain that evolved it should be tenderly removed from its case and thoroughly examined. Then, too, it is out of place in the room and takes up valuable space as well. Owing to its blistering heat at close range, it is shoved well into the room, so that a little of the paint and paper may stay on the wall, and in doing this furniture becomes crowded or a portion of it relegated to the attic for the winter.


A fireplace in a genuine old Colonial kitchen

If it be desirable to keep open all the rooms used in summer, the majority must have stoves. This means much care and more fuel, and is really more expensive in time and money than running a furnace.

Aside from the standpoint of artistic merit and floor space, the one fact already mentioned, that of unequal heating qualities, would alone condemn it.

The first efforts to warm by centralising the base of heat in another enclosure from those to be cared for was through the agency of the furnace. This separation of the heating agent from the living rooms of the house is the principle now believed to be the correct one, and, as demonstrated through the use of steam and hot water, this belief is confirmed.

The principle of the furnace is in the gathering of fresh outside air within a heating chamber, and delivering it, warmed, through pipes to the rooms desired. This is called an indirect system—the source of heat not being directly connected with rooms to be heated—and as it delivers fresh air it is a partial ventilating system as well. This last is one excellent point in favour of the furnace, and yet we frequently find cases where the air supply is drawn from the cellar itself. This is bad; the furnace should always be supplied with fresh air direct from outdoors.

It is safe to say that 99 per cent. of the furnaces in use are too small

for the work required of them. The furnace should be 20 per cent. larger than the actual figured size, and heating power should be carefully calculated before the furnace is decided upon.

The great fault with the system is the difficulty in driving the heated air against the wind. With this in mind the allowance in size of the furnace, as stated above, is advisable; also, the setting of the heater somewhat toward the point of strong wind.

The principle of the delivery of heat is that hot air rises. Such being the case, it is hardly to be wondered at that in low cellars, where the pipes instead of being "pitched" are run horizontally, the delivery is not satisfactory. Furnace pipes should be pitched 1 foot to every 10 feet of run, and no flat run should exceed 20 feet; less if possible.

It has been suggested that the fresh-air duct be carried through the building, so as to have two inlets and thus avoid the possibility of the hot air reversing and following out through the duct. This is undoubtedly a wise precaution, but in any event the duct should be made of galvanised iron to avoid leakage. It is well to consider, too, the advisability of providing for a supply of cold air to mix with warm in such

Old mantel in the Ladd House, at Portsmouth, N. H. The Franklin stove is here shown

a way that the excess of heat may be tempered before delivery; thus the supply of fresh air is not cut off by closing the register. The area of the cold-air duct should be about that of the sum total of warm-air pipes. This is slightly excessive, owing to the expansion of hot air, but the delivery will be freer than if it were smaller.

A hall fireplace at Wynnewood, Pa. David K. Boyd, architect

Much has been said as to the relative merits of the cast and wrought-iron furnaces. It is claimed that the former, when hot, is porous and will allow the escape of noxious gases; on the other hand, the latter is said to suffer by expansion and contraction so that the joints are damaged to the same end. If both are properly made and set up, there is probably little choice between them. The principal points to observe in the choice of a furnace are that it should have few joints, be simple in construction and working, and have a large amount of radiating surface in proportion to the fire box.

Registers should not be placed in the floor if it is possible to avoid it, as dust falls into them easily, and is discharged again with the hot air, much to the detriment of the latter. They are best placed in the vertical wall, and usually at a point just above the baseboard. As most of the register designs are painfully ugly, care should be taken in their selection. There are a few creditable patterns on the market, for which we should be thankful.

The best location in the room for a low register or radiator is perhaps under a window, or, at least, in the outer wall. This, however, offers several difficulties to the furnace, the chief of which lies in the extra run of flat pipe, which hinders effective delivery.

Owing to the several objections already stated, the furnace may be said to be a good heating agent for a house of small area; the larger edifice requires a different system. The furnace man will tell you that two heaters can be used, and cite cases where even more have been installed with good results.

We will not deny this. Still one cannot but reflect that the man who has the courage to tackle more than one of these propositions has more pluck than the majority of mortals.

One register (preferably that in the hall) should have the louver slats removed so that it may always be open. This will prevent an accumulation of heat if the other registers should be closed. The heat duct should never run straight up from the furnace; its flat run should extend several feet beyond the outer limit of the heater.

An adaptation from the Japanese. Simple and effective, especially the natural-wood finish. Fall River, Mass. Cram, Wentworth & Goodhue, architects.

Heat ducts passing between floors or through wooden partitions should have an inner and outer pipe with an inch air space between them. If within 12 feet or less of the heater, asbestos sheathing may well be used in addition, being carried to a distance of perhaps 25 feet from the source of heat. They should be at least 3 inches from studs and floor timbers, and the adjacent lathing should be of metal. A metal shield, suspended from the floor timbers, below them and free from the heater, is an excellent protection for the woodwork.

In steam and hot-water heating the heater is, as in the case of the furnace, centralised, and the steam or hot water distributed through pipes to coils or radiators. These several sub-centres of heat distribution are placed in three ways, which give three different methods of heating. Radiators placed in the rooms to be heated heat the air already in the rooms; this is called the direct system. Coils of pipe placed in metal chambers under the rooms to be heated, or nearly so, receive fresh air from the outside and deliver it heated, through vertical ducts to the rooms above; this is called the indirect system. Radiators placed in the rooms to be heated (or coils in recesses in the walls), receiving fresh cold air upon them, deliver the same heated to the rooms in which they are placed; this is called the direct-indirect system.

Direct radiation is at once the cheapest and most common system. For the country house, however, it should not be used in the living rooms on

account of its non-ventilating qualities, and also because it has no place in the room, nor is it up to the present time a thing of beauty.

Ordinarily the best place in a room for the direct radiator is under the window, or, at least, against the outer wall. If placed against a blank wall, the space above it becomes useless, as a picture or mirror hung above it is soon seriously injured.

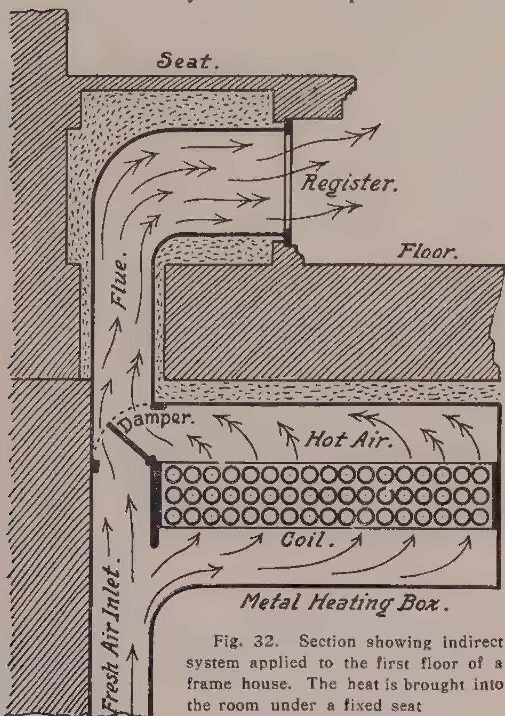


Fig. 32. Section showing indirect system applied to the first floor of a frame house. The heat is brought into the room under a fixed seat

It requires nearly twice the radiating surface to heat with the indirect radiating system that it does to heat with the direct. At the same time one-half the ventilation problem is accomplished by it, as it, like the furnace, supplies fresh air. Thus it will at once be seen that it is the system for the living rooms of the country house. In the case of a frame house it can be applied to the first floor by delivery through a register in the front of a fixed seat, which should be in the outer wall (see Fig. 32). In a brick wall the delivery flue can be let into the wall. In supplying heat to the second story of a frame structure the duct should not be carried in the outer walls, owing to their coldness.

In order that the inflowing air may be tempered to the conditions of the weather, it is best to allow for the introduction of cold air which shall mix with the hot prior to its delivery into the room (see Fig. 32). As shown in this cut, the fresh-air flue extends upward to the seat and is intercepted by a damper, which, when lowered, diverts the supply through the heated coil into the upper part of the flue and thence into the room. Thus it will readily be seen that the temperature of the supply is well under control.

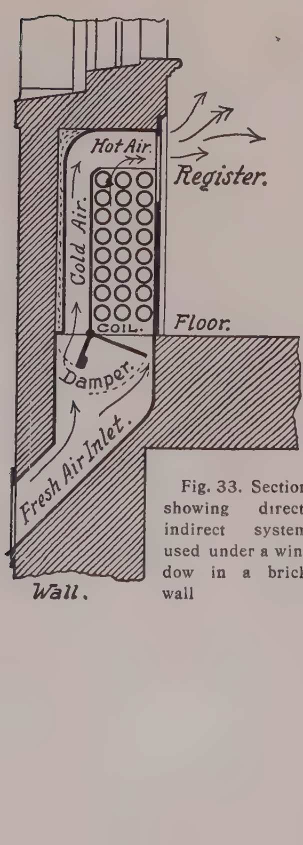


Fig. 33. Section showing direct indirect system used under a window in a brick wall

The direct-indirect radiating system, unless the radiator be let into the wall, is open to the same objections of disfigurement as the direct system. Often it can be used in a room that it is desirable to ventilate, which is surrounded by rooms in which special ventilation is not desirable. Its application is best perhaps in a brick wall (see Fig. 33). The air is taken in from below and passes through the coil into the room. By opening the damper into the cold-air flue, the supply of hot air is correspondingly closed, thus tempering the heat. The opening into the room can be either a full-sized register or, better, limited

to the top as shown. In Fig. 33 it comes nearer to the indirect system, lacking only the intervening duct which serves to mix the cold and hot air before delivery into the room. This system applied to the wooden wall would force the radiator into the room, and the fresh-air inlet would be below it in the floor.

Steam and hot-water systems have many points of similarity. Both feed their heating vehicle through comparatively small pipes, in which the heating vehicle, whether in double or single pipes, effects a current and returns to the seat of its generation.

A brief synopsis of the various systems of steam and hot water may serve to show their several points of similarity and difference.

A glazed-tile mantel. For ordinary use the addition of a simple tile shelf, supported on consoles, would be desirable

In the two-pipe steam system the flow main rises from the boiler and connects by small branches with the several radiators, while the return pipes, connected with each radiator opposite the flow entry, are carried down independently to the main horizontal return located below the level of the water in the boiler. Although the independent return may be preferable, it is the practice in a tier of radiators to connect with a common vertical return pipe. The objection to the former method is in the extra expense of piping, and, in some rooms above the first floor, the ungainliness of the added piping in the rooms.

In the one-pipe steam system the mains are carried up and make one connection with each radiator, each pipe serving for flow and return. In this the principle lies in the fact that the higher-temperatured vehicle flows in the upper part of the horizontal pipes. (This principle is explained in chapter 12.)

In the overhead supply steam system the flow main is carried upward to a height above the topmost radiator, and is connected with the various heating surfaces in the interval of its downward course. The return pipes are independent of this circuit, at least until a level below that of the water in the boiler has been reached.

The perfect system of the two-pipe hot water type is one in which the flow main is carried upward to a point above the radiators, where it enters the expansion tank at the side, leaving room above for the expansion of water. The return is connected with the bottom of the expansion tank, and it is this return pipe which serves to supply the radiators in its passage to the heater. The overflow pipe extends upward from the top of the expansion tank, either through the roof or

into such drains as may be expedient. It will readily be seen that, as the flow main enters the expansion tank above the outlet into the return, the tank is really in the latter. Therefore, in more or less complicated systems the expansion tank is often connected with an independent pipe rising directly from the horizontal return near the heater. It is important to remember, however, that the supply to radiators should be made, as already stated, through the return pipe, or at least not to connect with the flow lower than the point of its turning, and that the nearer the above principles are carried out the better will be the working of the system.

A parlor mantel at Lynn, Mass. The interrupted pediment makes a good top motive, but the mantel bears no relation to the lines of the room

The one-pipe hot-water system is similar to that of the single-pipe steam, with the difference that the feed and return are effected through separate branches connecting the main with the radiators.

In both steam and hot water the horizontal pipes have a slight downward pitch in the direction of the flow of the heating medium.

The mains are commonly covered with felt (often reinforced with asbestos) in their passage through space, where it is desired that the heat of the pipes shall not suffer from exterior cold or as a guard against fire. For this latter purpose there are several patent sheathings in use.

The size of the mains decreases and increases in proportion to the supply of the heated vehicle carried by them. In distribution they are supposed to diminish as each sub-heater is supplied; and in return they increase according to the outflow of the radiators. For instance, in low-pressure steam the main flow pipe leaving the boiler to supply 1,000 square feet of radiating surface would be 3 inches in diameter. This would decrease through several fixed sizes to the smallest ($1\frac{1}{4}$ inches).

With the steam boiler it is not necessary that it should be below the level of radiators or coils, while with hot water this is important; therefore with a low cellar the problem is easier with steam, provided indirect radiation is used.

As the low-pressure steam radiator is reckoned at about 210° F. and the low-pressure hot-water radiator at about 140° F., it will be seen that the radiators of the former would be much smaller than the latter for the same amount of work.

The hot-water plant is more expensive than steam, but it is claimed that the wear and tear is less than in steam.

Steam requires more constant attention than hot water, and is somewhat more dangerous. Although the danger from fire is slight in the steam plant, yet care should be taken to protect woodwork near the carrying pipes.

As the temperature of steam radiators is higher than that of hot water, it is harder to regulate the heat to moderate weather.

Taking all things into consideration, there can be little doubt but that hot water is the heating medium for the average country house.

A parlor mantel at Salem, Mass. A delicate effect in white and gold. Note especially the facing tile, fender and andirons

In the perusal of the various works on ventilation, one is struck with the variety of principles and the beautiful way in which one authority disposes of those of all others. Some claim that carbonic acid, the poisonous gas given off with the exhaled breath, falls to the floor because of its weight, and others that it rises from the fact of its lightness or from other reasons. From this mass of varied information the following principles are advanced, as being those favoured by the majority of the best experts.

The number of country houses that have been fitted with special arrangements for ventilation is comparatively small, for while it is now acknowledged that the kitchen should be furnished with a vent to rid it of the numerous odours indigenous to that room, yet the more harmful gases of the living rooms, which often cannot be detected by the sense of smell, are allowed to pass unnoticed. We sit in a closed room, under conditions of excessive heat, aud wonder whence that pressure at the temple, that headache or that sickness.

Under the conditions of the closed room, the limited supply of air soon loses its vitality and becomes exhausted of its life-giving oxygen. Its deterioration is due, then, to its loss of the aforesaid oxygen by respiration and by combustion from heater and lights, and by contamination from the exhaled carbonic-acid gas. Is it any wonder, then, that under such conditions the starved and poisoned system, not receiving proper consideration, should be anything but healthy?

In order that the house may be kept in a normal condition, it is first necessary that it should be comfortably warm and receive fresh air to replace the discharge of the foul. With the country house these conditions are not at all difficult. During the mild or warm weather the windows are open. Hence, during the greater part of the time the conditions are nearer to those of the open air,

and the problem is simple. Under conditions of damp or rainy weather the closing of the windows makes itself felt at once, and it is necessary to use a little heat to dispel the moisture and supply a vent for the escape of foul air. With the heat, enough fresh air can be had from the windows without inconvenience. In the winter, the conditions being extreme, it is evident that some artificial means must be resorted to for the accomplishment of the desired results.

In the heating and ventilating of the house it has been considered that the two systems working together form the cheapest as well as the most effective solution of the problem. Thus, by the use of the indirect system, heat and fresh air are at once supplied, and by ventilating into a common flue in the chimney, in which the heater and range flues are carried up through galvanised iron pipes, the draught in that direction is assured. In natural draught, where no accelerating heat is used to force the circulation, as in the above, there is apt to be, at times, in mild weather, where internal and external conditions are nearly equal, some difficulty in the working of the flue, and for this reason the forced draught is advisable. If the heater and range flues are not practical to get at and a forced draught is desired, it can be effected by a small coil in the main outlet flue.

A dressing-room mantel. Not too formal; just enough abandon in its design to recommend it for its place

One of the best ventilators for the country house is the fireplace, which should always remain open. For the summer house it is likewise capable of furnishing what little heat would be desired for the season, and thus it serves two purposes at once.

Ventilation by aid of the window may be effected in a manner to avoid direct draught, by raising the lower sash and inserting a 5 or 6 inch board and dropping the sash upon it. An improvement of this simple method can be bought at a slight expense, and consists of a perforated board so arranged as to allow the indirect passage of air. By aid of this the circulation may be had at both the middle and bottom of the window.

For the country house the best location for the inlet register is near the floor on the side of the exposed wall; it should of course be set vertically. For winter the outlet should be nearly opposite, in the wall, near the floor; for summer the opening near the ceiling, capable of being closed and opening into the same duct, is most effective. This top duct will also serve to reduce the bad air from the lights at the top of the room, as, if closed in the ordinary way, it

will leak slightly. In the case of the fireplace being used as the floor duct, the top duct should not be placed above it. It may be in another inner wall or in the centre of the ceiling (as the centrepiece), but never above a source of heat or in the outer wall.

In the above calculations we have not considered the direct radiator, as it is best to use it in such rooms as it is necessary to fit with a fresh-air inlet.

A good fireplace of tile. A suggestive example, but too much crowded by the flanking doors, and out of harmony with surroundings

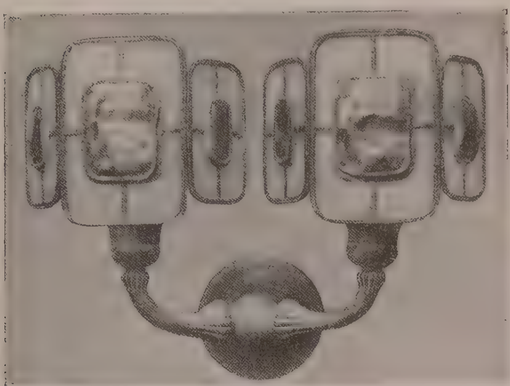
In order that one may form some idea of the necessary units to be supplied in the heating and ventilating of a house, certain principles and assumed conditions must be borne in mind in order that a basis of rough calculation may be arrived at.

Air, whether in the room to be heated or introduced into it through ducts, is warmed by an agent considerably higher in temperature than that desired for the room. Heated air loses by radiation from the walls of the enclosure into which it is introduced. Hot air, rising, moves faster and with less friction through a vertical than through a horizontal duct. Exposure to cold winds affects the temperature of a room, owing to unavoidable leakage and contact of air with cold walls. This leakage is about equal to the cubic contents of the room per hour. Although the leading authorities differ considerably, it is generally considered, however, that 1,800 cubic feet of fresh air per hour be allowed for the use of each person; Baldwin places it as high as double this amount.

The normal temperature for artificial heat is usually placed at 70° F.; the low external temperature for this climate (New York) at zero F. For an average condition of walls and windows with light on two sides, to heat to 70° F. at zero weather, hot air should be introduced at 100° F. Add 10 per cent. to heating power for exposure to prevailing cold winds. A rough estimate of the size of furnace pipe required to heat an ordinary room to 70° F., external temperature at zero F., may be made by allowing 1 square inch in sectional area of pipe to each 20 cubic feet of space to be heated.

Owing to the awkard obstruction offered to the passage of air through the ordinary register by the perforated ornamentation, at least one-third increase in area should be allowed over that of the connecting air-duct. While the velocity is decreased in its passage through this ornamentation, the increased area makes the total discharge about equal to the uninterrupted discharge. Hence there is no reason why the registered-covered opening should not work as well as the free opening.

The low-pressure steam radiator is usually assumed to have a temperature of 210° F., while in low-pressure hot water it is 140° F. One hundred running feet of 3-inch pipe in a coil for indirect radiators contains about 100 square feet of radiating surface. To heat a room by indirect radiation, which necessitates ventilation, requires nearly twice the amount of radiating surface that is necessary for indirect radiation, which has no other change of air but that of leakage.



The screens of this unique bracket lamp are constructed so as either to shade the light, as in the illustration, or to swing around and leave the light exposed. It is suitable for either gas or electricity

The size of a steam-heating boiler is fixed by the amount of radiating surface to be supplied. At 20° F. a square foot of heating surface in the boiler will be required for each 5 square feet of radiating surface; at zero F. 6 square feet are necessary. One horsepower is equal to the supply of heat for 90 square feet or radiating surface; thus an 11 horsepower boiler is required for 1,000 square feet of radiating surface.

Exterior bracket lantern

Where warm air is delivered or ejected through flues, the velocity increases with the length of the flue under normal conditions. We assume as a basis of calculation that, with the temperature below 50° F., hot air thus delivered to the first floor has a velocity per second of 4 feet, to the second floor 5 feet, and to the attic 6 to 7 feet. In natural-draught ventilation the velocity per second of the ejected air is 6 feet from the basement, 5 feet from the first floor, 4 feet from the second floor, and 3 feet from the attic.

In making the rough estimate, the first and second story halls are usually considered as one room.

The amount of radiating surface necessary for the heating of a room is that required to supply the heat carried out of the room by the escape of warm air (in other words, to heat the incoming cold air), plus that required to make good the loss of heat sustained by the incoming air by radiation from windows, doors and walls. For steam and hot water the following rules given by Baldwin are as good and as simple as any:

To determine the amount of radiating surface necessary to supply the heat carried out of the room by the escape of warm air, multiply the number of cubic feet of air per hour by the number of degrees F. at which it is to be heated, and divide the product by 12,500; the quotient is the radiating surface required in square feet.

To determine the amount of radiating surface necessary to compensate

for the loss by radiation from windows, doors and walls, take the difference in temperature in degrees F. between the lowest outside temperature to be provided for and the temperature at which the room is to be kept, and divide it by the difference in degrees F. between the temperature of the heat pipes and the temperature at which the room is to be kept. Multiply the quotient thus obtained by the number of square feet of glass plus the number of square yards of external wall surface in the room, and the product will be the radiating surface required in square feet. In this rule it is supposed that the external walls are of brick; if of wood, they should be allowed for according to their air tightness and comparative temperature. For the rough estimate, however, the straight rule is near enough.

To understand the application of the above rules, suppose that we have a room to be heated by indirect steam; that the amount of air to be supplied per hour, including ventilation, is 5,000 cubic feet; that the room is to be heated to 70° F. in zero weather; that the temperature of the radiators is 210° F.; that the area of glass is 30 square feet and the area of the external wall is 20 square yards—then, by the first rule we have: 5,000 x 70 divided by 12,500 equals 28, the number of square feet of radiating surface required to heat the incoming air (or in the terms of the rule—to replace the escaping air).

Mantel in living room near St. David's, Pa. David K. Boyd, architect

By the second rule we have: $\frac{70}{140}$ x 30 plus 20 equals 25, the number of square feet of radiating surface required to compensate for the loss of heat by windows, doors and walls.

Then the sum of the results of these two rules (28 plus 25 equals 53) is the total amount of radiating surface in square feet required to heat the proposed room to the proper temperature under the given conditions.

As the temperature of the heating surface of a furnace is between 400° and 500°, 1 square foot is usually taken as being equal to 6 square feet of steam radiator, or equal to heating approximately 300 cubic feet of space. Therefore, if a furnace be required to do the work as suggested in the above example, it will take 6.63 square feet of radiating surface to perform the work. The above rule for the furnace may be applied to the stove.

The following table by Professor Carpenter shows the number of changes per hour required to supply one person with 30 cubic feet per minute, or 1,800 cubic feet per hour:

Cubic feet space per capita	No. times air is changed per hour	Cubic feet space per capita	No. times air is changed per hour	Cubic feet space per capita	No. times air is changed per hour
100	18	400	4.5	700	2.6
200	9	500	3.6	800	2.25
300	6	600	3	900	2

The net area in square inches of either the hot-air or ventilating duct for each 1,000 cubic feet of air, moving with any given velocity, can be determined from the following table by Professor Carpenter:

Velocity in ft. per second	NUMBER TIMES AIR IS CHANGED PER HOUR							
	1	2	3	4	5	6	8	10
1	40	80	120	160	200	240	320	400
2	20	40	60	80	100	120	160	200
3	13.3	26	40	53	67	80	107	133
4	10	20	30	40	50	60	80	100
5	8	16	24	34	40	48	68	80
6	6.7	13	20	27	33	40	53	67
8	5	10	15	20	25	30	40	50
10	4	8	12	17	20	24	32	40

Or, the area of the duct in square feet can be determined by dividing the cubic feet of air per hour by 3,600 times the velocity.

The following approximate rules from Baldwin may be found of interest:

Having the cubic feet of air to pass through a building in an hour (x), and warmed by steam to 100° F., then: The weight of steam in pounds required to warm same = x ÷ 500; the weight in pounds of coal required = x ÷ 5,000; the square feet of grate required = x ÷ 60,000; the cross-sectional area of chimney flue (provided that its length be under 100 feet) = x ÷ 500,000; the horsepower of boiler = x ÷ 15,000; the number of square feet of heating surface in boiler = x ÷ 1,000.

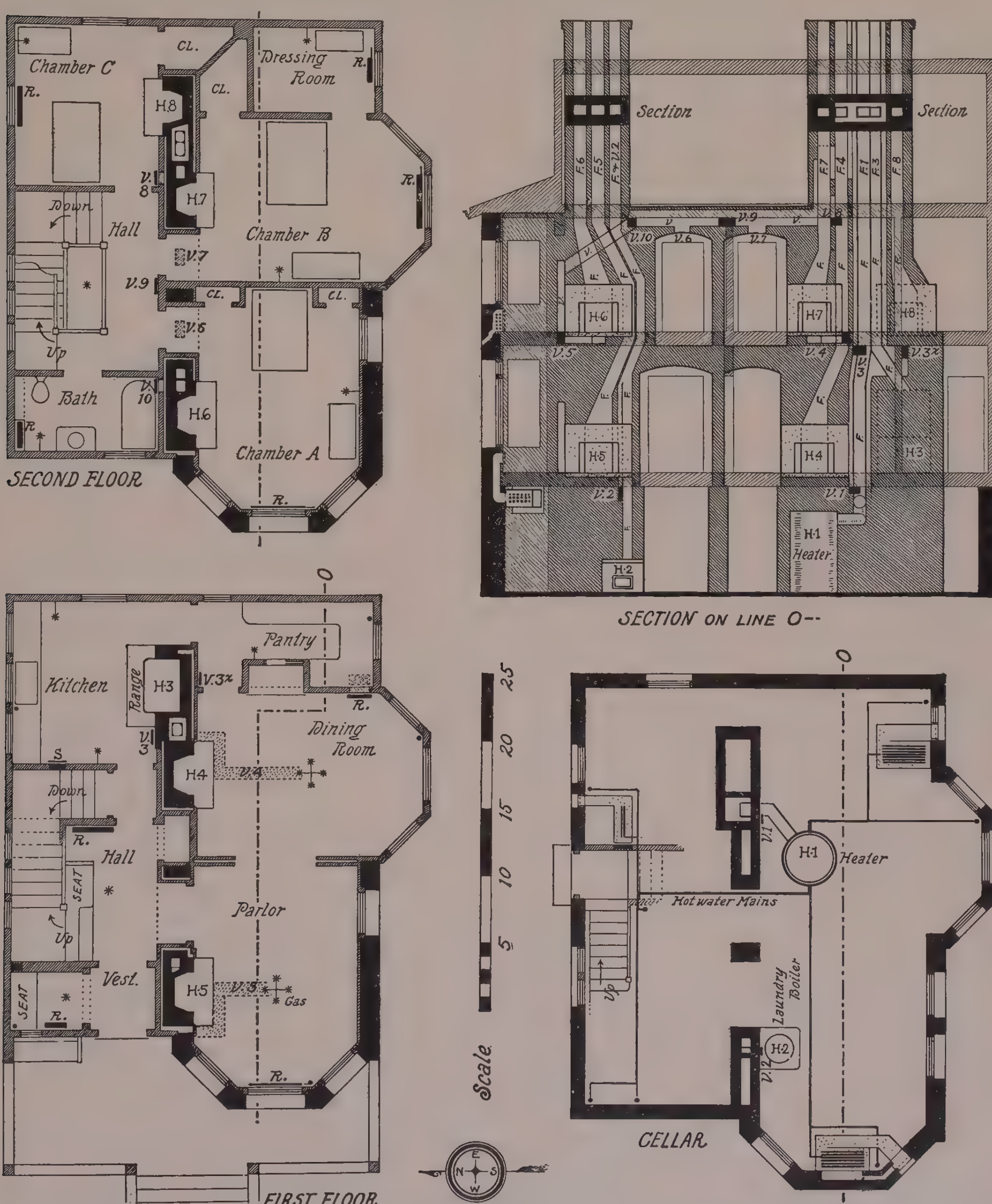
For the sake of applying some of the foregoing rules, let us take the accompanying plans of a small six-room house which is to be heated and ventilated.

The house is a frame structure, with the exception of the exterior walls of the parlour and chamber (A), which have been assumed as brick in order to show the problem under such conditions. The continuing of the brick wall so as to tie the two chimneys together (see section) is not practically necessary; in fact, it could just as well be omitted.

The parlour, dining room and the three chambers are fitted with fireplaces, which answer for the removal of chill and as winter ventilators. To simplify the problem, the consideration of the attic has been omitted, as has also the location of the return pipe to the heater.

The heating medium is supposed to be hot water, which supplies the parlour and dining room by the indirect system, and the chamber (A) and bathroom by the direct-indirect system. Thus the three rooms to which it is most desirable to supply fresh air are taken care of; the chamber (A), because of its brick wall offering a chance to apply the direct-indirect system, is treated

in this way. The other rooms, with the exception of the kitchen and pantry, are heated by direct radiation, which, being cheaper than the indirect system, can well be taken advantage of here. The kitchen depends on the range, the cellar on the heater, while the pantry naturally has no heat.



Plans and section showing the ventilating and heating of a small house. H—heater, V—vent, F—flue, and R—radiator and register

When possible, the radiators and inlets have been placed next the outer walls, and under windows if possible. In the dining room it seems advisable that the inlet duct should enter through the pantry, thus affording an easy solution of the vertical register and raising the low temperature of the room through which it passes. The halls have been treated as one room and the radiator placed on the floor, as the hot air in its passage up through the stairway is naturally forced toward the outer wall. The vestibule has been provided with a radiator in order to raise the temperature of the leakage around the inner door into the hall. The bathroom radiator has been placed in the northwest corner as being the best location.

Hanging electrolier, composed of a painted wood figure-head motive and antlers

Inlets for fresh air have been provided for in the four rooms already mentioned through the medium of the heater, and in addition to these it is advisable to provide for a fresh-air inlet in the kitchen. That this may be tempered from the extreme cold of the outer air, it is passed over a small coil and brought into the room about 7′ 6″ above the floor; the coils are sufficient to produce a temperature of 30° F. in zero weather; this may be reduced if it be seen fit. The fresh-air supply for chambers B and C is admitted through the windows, as such can be readily done by using the window board previously mentioned. Fresh air for the hall is supposed to be supplied by leakage in cold weather. The fresh air supplied to the coils comes directly to them from the adjacent cellar windows; if a more extensive indirect system be used, this supply would be brought into the cellar through large ducts opening on either side, and following under the cellar bottom to supply the individual coils.

The vent outlets are through the fireplaces, as previously stated, and by top ducts, all leading to a large flue in the rear chimney, through which the range and heater flues, made of galvanised iron, are passed. This forces a draught, and it is probable that one or the other flue will be hot for a considerable part of the year.

The kitchen vent is near the ceiling and the range, and a vent has been provided for in each chimney in the cellar. The top vents in parlour and dining room are through perforated centrepieces above the gas jets. Being used mostly in summer, they will carry off heat from the lights, and such air as is injured by combustion, as well as the other impurities. The vents to chambers A and B are placed on the under side of the arches, opening into the hall. The hall vent is on the second story, and is provided with an outlet at the top and bottom, the top outlet being arranged so that it may be closed in winter.

With the above no calculation has been made in connection with allowances for combustion of air by lights. One jet in a room is hardly worth considering, but in the case of a four jet light it may be well worth the while.

Following is the rough table of calculations for heating and ventilating the small house shown in plans:

The conditions assumed are as follows, viz.: Hot water at 140° F., external temperature at zero F., desired temperature at 70° F., each person allowed 1,800 cubic feet of air per hour, basis of brick walls (allow for wood if desirable), cold winds from the north, hot-water heat, indirect for parlour and dining room, direct-indirect for chamber and bath, and direct for rest of house. Natural draught, as such basis will cover the conditions of forced draught.

	Cubic feet	Sq. ft. of glass	Sq. yds. of Ext. Wall	Persons	Sq. ft. of rad. surface to heat air	Sq. ft. of rad. surface to make up for loss of heat	Total sq. ft. of radiating surface	Size of heat duct in sq. in.	Size of vent duct in sq. in.	Size of fresh-air duct in sq. in.	Allowances made
Hall	1,990	50	60		11.1	110	121.1		19.9		North exposure
Vestibule	470	30	34		2.6	64	66.6				North exposure
Parlour	1,740	78	92	3	30.2	170	200.2	43.2	43.2		N. W. window
Dining room	1,790	60	24	3	30.2	94	124.2	44	44		Al'wed for pantry wall, 10 sq. yds.
Pantry	627								5.4		No heat
Kitchen	1,300			1.5	3.3				21.6	10, to enter 1,400 cu. ft. at 30° F.	Heated by range
Chamber A	1,600	65	55	2	20.1	120	140.1		25.6	40	Direct-indirect heat
Chamber B	1,600	50	26	2	20.1	76	96.1		32		
Dressing room	425	12	38	1	2.3	50	52.3		8		Vent through chamber B
Chamber C	1,070	30	52	1	10	82	92		20		North exposure
Bath	480	15	40	1 at 1,000 cu.ft.	5.6	55	60.6		13	8	Direct-indirect heat
Cellar	7,000								47 (2 vents)		Heated by heater
Total	....	....	....	....	.....	.....	953.2	.....	278.9		

The above system of heating and ventilating could be installed for about $650.

The lighting of the country house, which offers such delightful chances for the display of taste, is usually slighted. By this it is not meant that not enough light is provided, but that the choice of it, as adapted to various uses, is hardly ever considered. Every room receives the same glaring treatment—a flood of light calculated to destroy the effect of the interior and everything it contains.

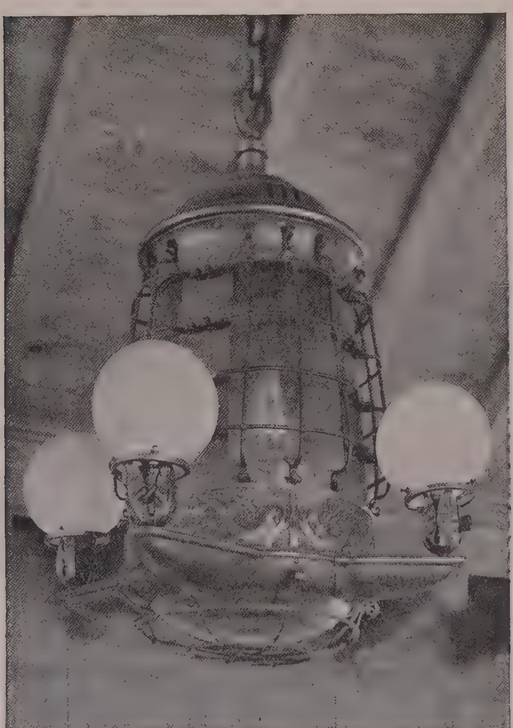
It should be remembered that it is not always desirable, in fact it is generally better not, to have a bright light in the home. There are cases when, as in reading, sewing or cleverly locating a fishbone, the light should be powerful enough to answer the purpose, but on the other hand every opportunity should be taken to subdue the light when not actually needed at full power, so that the

over-tired eyes of present-day existence may be favoured as much as possible. Besides this, the effect of a room and its contents under conditions of subdued light is far superior to the other extreme.

For houses in districts not supplied with gas or electricity, the lamp is the usual medium used. This can well be replaced by the candle in many cases, as at the dinner table, where ordinarily it is excellent. It is a beautiful light, and soft for the eyes, its principal objection being in the constant care it requires. A candle is now made with a hollow core which receives the melted wax, thus removing the objection so many may at once advance. Several varieties of branch candlesticks can be procured, notably the seven-branched Jewish pattern, which, if well reproduced, is excellent.

The lamp, even if desired to give considerable light, should be covered by a shade opaque enough to subdue as much of the room as is practical. The use of stained glass for shades has given some very beautiful results. Whatever shade be used on a light it should not be combustible; ballet skirts are not appropriate, and, even if used artistically, are too dangerous to be risked. It is a question as to whether the increased power of the oil light is a step in the right direction. There certainly is a limit to its usefulness, and it is possible, too, that that limit may have been exceeded.

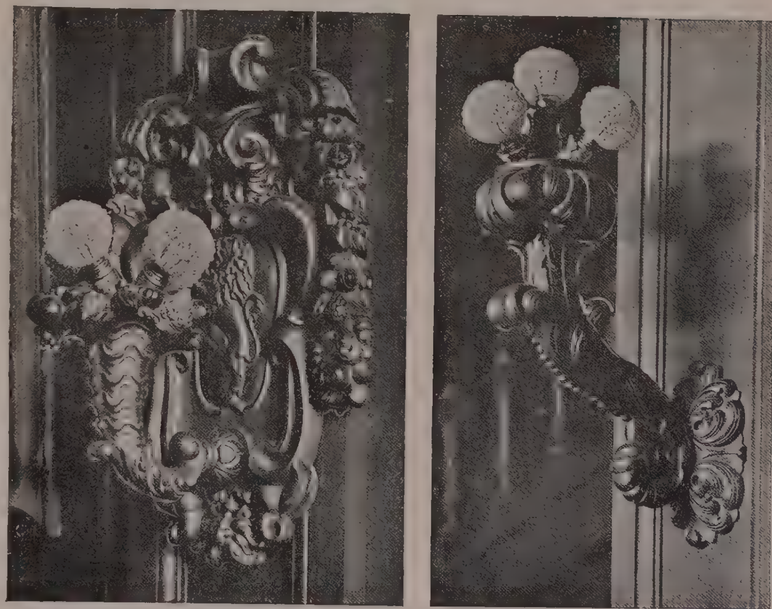
There are those who denounce gas and electricity for the country house, but this seems too sweeping a condemnation. Of the two, gas, though the weaker light, is harder to control artistically. With the mantle light of lower power, and the ground and perhaps tinted chimney, it is possible to get some fairly decent results, although for the overhead light a semi-opaque shield should be placed at the bottom to protect the room from light passing through below the chimney. Electric-lighting appliances for gas are useful and labour-saving auxiliaries, and, being run by a battery, their expense is practically nothing. Only the best insulated copper wire should be used for wiring.



A hanging electric lantern

It is by all means advisable to pipe and wire a house for gas and electricity, even if there be but a passing possibility of ever using it. In some remote localities the latter is more likely to come than the former.

The electric light, although quite powerful and glaring, is readily subdued. Using a low-power lamp with an enclosing bulb of fairly thick semi-opaque glass, which can be tinted if



Electric sconces in the style of the Renaissance

desired, some excellent results are obtainable. Some of the flower treatments now designed are very artistic.

Perhaps next to the candle this light is the most pleasing, and it surely offers more variety than does that light of olden times. Owing to the fact of its range from great brilliancy to extreme softness, it is perhaps the best all-round light we have. It is safe, too, provided it is properly insulated.

In cases of gas and electricity, where it is practical it is better that the lighting be done by both the subdued and fairly bright lights. For instance, a wall sconce could have two subdued and one bright branch, or the chandelier four subdued and two bright jets. In this way the room can be lighted for such purposes as may be desired.

Lights for reading should be low, ordinarily on a table. Gas or electricity in the dining room should be installed in a chandelier, which is often used in the parlour as well.

For all purposes of entertainment and general lighting (barring the dining room) the wall light is the best and most effective. Its distribution of light is better than from a central source, although in a long room several hanging lanterns may effect a similar result. For the wall light can be used the sconce or bracket of olden times, which is reproduced and adapted to both the candle and the electric light.

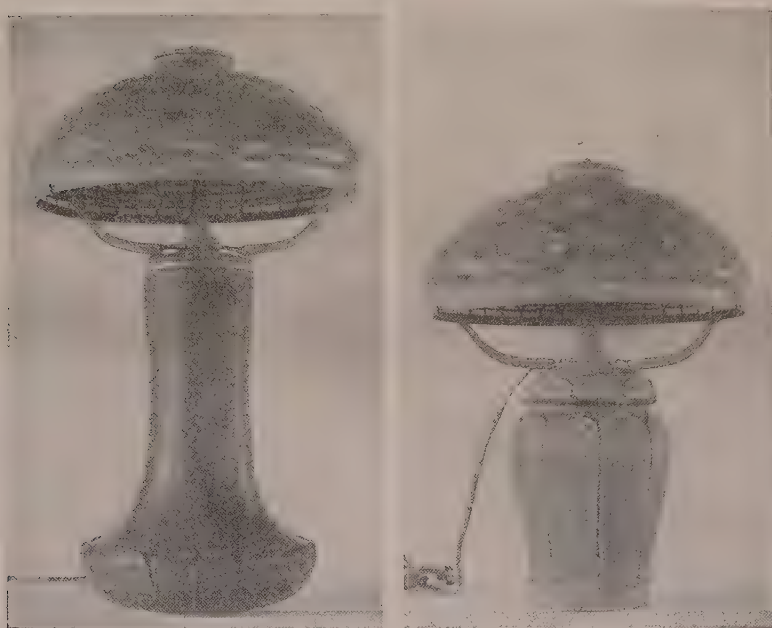
In the case of lanterns, some of the Japanese examples are excellent in design and variety of patterns. They are lit by candles, and are reasonably safe as regards fire.

For the hall and vestibule the lantern is generally used, and for the billiard room a drop light of sufficient power is demanded by the conditions.

In the other rooms of the house where the single jet is used, as in the chambers, bath and kitchen, its position should be carefully considered in reference to the work required of it. In the chamber and bath the mirror is to be lit, and the wall bracket is best for this purpose. In the kitchen the top light or one or more side lights can be adopted, as seen fit. The bottom and top of stairways should be well lighted; nothing can be saved by neglecting this measure of precaution. It is well to bear in mind, in locating fixed lights, that their position should be such, if possible, that

the curtain picture shall not occur. This is a great source of annoyance to the occupants of the house, and destroys its privacy to a great degree.

For gas lighting it is important that the following points be observed: All pipes to be connected with red lead, capped and proven by careful test to be tight, before they are covered up. Pipes to be thoroughly secured with iron devices used for this purpose. All centre pipes shall be secured to a continuous solid support. Branch outlets must be taken from the sides or top of the main lines. Floors should not be cut if it be possible to avoid it; if done, it should be by the carpenter only, and even then this cutting should be shallow and no more than 2 feet from the wall or other support. Pipes must be placed at the top of the floor joist, rather than at the bottom, so that they may be gotten at if necessary. Allow no use of gasfitters' cement. Nipples not to project more than three-quarters of an inch beyond the face of the plastering. The feed of gas should always be upward, except in the case of the drop light. All pipes should be placed so as to have a slight fall toward the meter. Caps to be left on all outlets at the finish of the work.


Electric table lamps—pottery bases and leaded-glass shades

For the home gas plant in which gasoline is used, the tank should be outside and underground, and the gas and air-proof air pump in a well-lighted place in the cellar with a vent to the outside air. It is important that the gas machine used be approved by the underwriters, in which case it is as safe as the ordinary gas.

For electric lighting, the material and workmanship should be of the best. The installation should comply with the requirements of the National Board of Fire Underwriters. In order that you may have the benefit of the best there is in the way of methods and appliances, it is best to specify that the installation be in accordance with the regulations of the underwriters, whose methods are always up to date.

Portion of a small bathroom showing enamelled lavatory and tub, with painted wails

CHAPTER XII

Plumbing

THE plumbing of the country house consists in the method employed to effect the supply of water from its source, carrying it over the house as desired, and of its final disposal in conjunction with the wastes into the sewerage system. Thus it will be seen at a glance that there are two systems, working together and useless when taken singly and yet more or less distinct from one another. There are several things in house construction that one cannot afford to economise on: A good foundation, a dry cellar, a tight and rigid shell, and good plumbing. The doors may be hung with iron hinges, the floors covered with cheap carpeting and the mantels be but the stained imitation of a nobler wood—all these accept, but sacrifice not the absolute necessity.

We will suppose then that the supply has been decided upon and arranged for, and that it has a sufficient "head" to carry it to the desired height and to flow with sufficient force, outside of the calculations of the house system.

The service pipe should always enter the cellar at a point handy to the source from which the water comes, and not on the opposite side of the house, as perhaps the plumber might wish. This point of entry should also be well below the reach

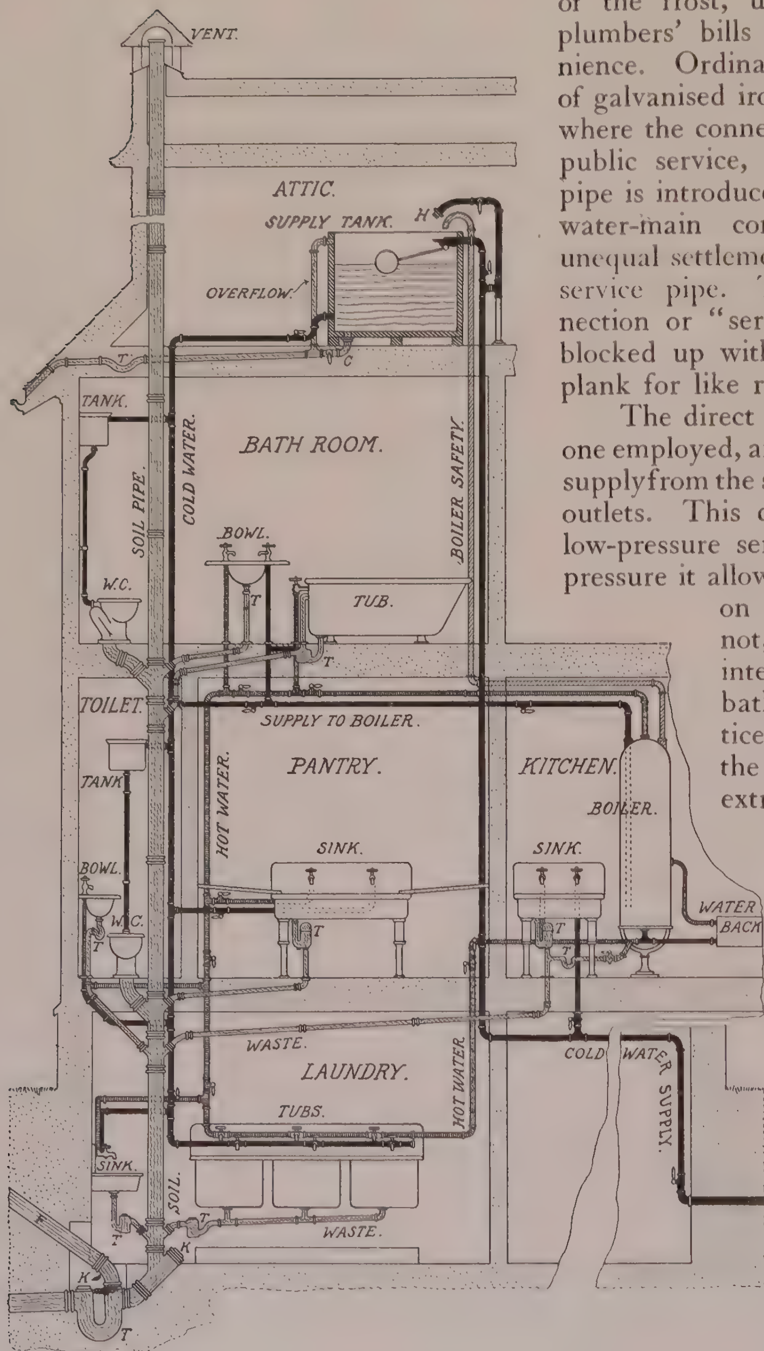


Fig. 34 Section showing the plumbing of a house by the system which avoids the use of the back vent. It could be installed, using enamelled fixtures with best workmanship and materials, for about $600. If soapstone tubs were used it would reduce the cost

C. Tank drain T. Trap H. Hose cock K. Clean out F. Fresh-air inlet

of the frost, unless you delight in plumbers' bills and general inconvenience. Ordinarily the service pipe is of galvanised iron, and in this case and where the connection is made with the public service, a short piece of lead pipe is introduced between it and the water-main connection. Thus any unequal settlement will not break the service pipe. This water-main connection or "service cock" should be blocked up with short lengths of solid plank for like reasons.

The direct system is the ordinary one employed, and consists in the direct supplyfrom the service to the individual outlets. This does admirably for the low-pressure service, but for the high pressure it allows of too great a strain on the pipes. Who has not, in his chance or daily interviews with some bathroom washbowl, noticed the staid placidity of the hot water and the extreme activity of the cold? You turn on the latter and it comes with a jump; it is hardly in the basin before it is out again—all over your shirt front. You turn it off, and the climax is a bang and a jar perceptible all over the house.

The reason for this contrast is that the cold water is on direct high presure, while the hot water receives its head from a tank in the usual manner. With a system like this

there are, to say nothing of the annoyances, decided indications that one of these days something will happen—something swift and snappy, with lots of gush attached—and the plumber will eat turkey. For a service where the pressure does not exceed thirty or forty pounds per square inch this system works well.

In cases of high-pressure service the indirect or tank-supply system is by far the best. On the principle that a column of water will rise as high as its source only, the extreme pressure is removed by making a new source of supply in a tank one story above the highest floor to be supplied. This breaks the service, so that instead of having the extreme pressure of the initial source we have a low pressure afforded by the extra height of the tank, which for all ordinary domestic purposes is sufficient.

Such a system is shown in Fig. 34. The supply pipe, entering the house from without, is carried horizontally under the cellar floor timbers to a point directly beneath the end of the tank. From this point it is carried vertically to the top of the tank, and the flow of water is there controlled by a ball cock. An overflow is provided to the tank, which, in this case, is carried to the house gutter, and contains a trap (T) to prevent outside invasion. The tank is further provided with a drain from the bottom (C) which connects with the overflow pipe; it is fitted with a stop cock. The pipe connection from C to the gutter should be large (say $1\frac{1}{2}$ inches), so that the flow of water and fine sediment may not be retarded during the cleaning process, which should be frequent. To faciliate the cleaning a hose-cock attachment is attached to the high-pressure service. This would also be handy in case of fire.

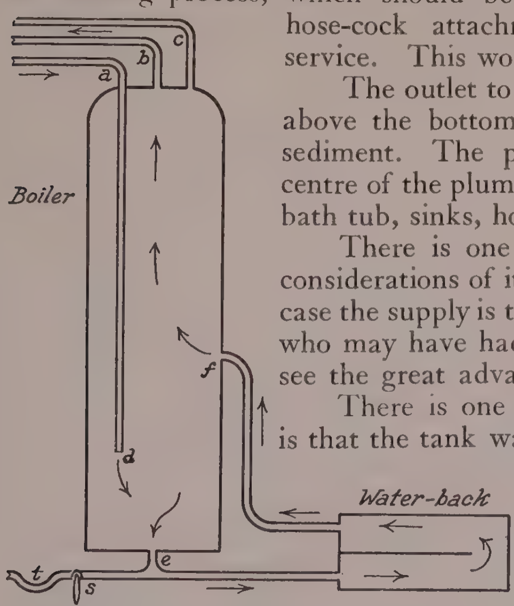


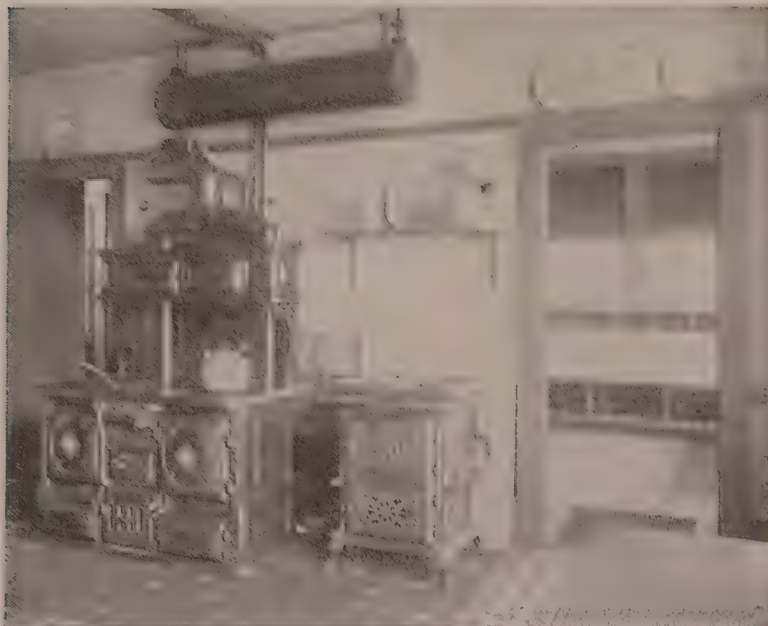
Fig. 35. Section through hot-water boiler and water back. The arrows show the direction of the flow of water

The outlet to the low-pressure service is raised slightly above the bottom of the tank to avoid its being fed with sediment. The pipe itself is carried down through the centre of the plumbing system, supplying closet tanks, bowls, bath tub, sinks, hot-water boiler and laundry tubs.

There is one advantage of the large tank outside the considerations of its ordinary use—it serves as a storage in case the supply is temporarily cut off from the street. Those who may have had some experience in this line will at once see the great advantage.

There is one objection to the above system, and that is that the tank water, while it may be wholesome enough ordinarily, is not very palatable for drinking purposes, as well as being normally warm. To obviate this difficulty a combination of the two systems may be used, and the cold water supplied to the kitchen sink be direct from the main (see Fig. 34). If desirable, the high-pressure pipe may be tapped on the second floor as well, but this, as in the case of the kitchen sink, should have heavy plumbing, and not the light fixtures usually forming a part of the bathroom fittings. The faucet, too, should have a large outlet, as the smaller its sectional area as compared with that of the

supply pipe the greater will be its velocity, and this is one thing which we wish to avoid. If the water will not stay in the pitcher while you are drawing it, what's the use?



A kitchen range with suspended hot-water boiler. This device saves the floor space, which, in this case, is required for the setting of the gas range

It is probably well understood that all substances expand with the application of heat and contract with cold. Water is no exception to this general rule. As this expansion increases the bulk without increasing the specific gravity, each particle of hot water is relatively lighter than the particles of cold water, and naturally rises when an opportunity is afforded. It is this principle that forms the basis of the hot-water system.

Fig. 35 shows a section through a boiler and waterback which will illustrate its application. The water is brought into the boiler from the top, through a pipe (a) which extends down through the inside to a point near the bottom (d). This cold-water entry should always be below that of the hot water (f); the greater the distance the better the circulation and the quicker the service. At the present time some boilers are made in which the connection from the waterback is made directly with the outlet from the boiler (b). These are said to give great satisfaction. The office of the boiler in this case, as in the ordinary system, is the storage of hot water, which accumulates at the top. The cold-water outlet from the boiler is in the bottom and connects with the waterback in the range. This waterback becoming heated, the water in it naturally takes an upward course and flows through a return pipe to enter the boiler at f. Thus the top part of the boiler becomes the hot-water storage and discharges through the outlet pipe at the top (b). Great care should be taken that the run of pipe from the waterback to the boiler does not pitch or sag in the direction in which the water is supposed to travel. Such conditions naturally destroy the circuit, as they violate its first principle. Pipes should have easy rather than abrupt bends, that friction may be reduced.

The pipe (c) is a safety pipe which extends up to the level of the water in the supply tank (see Fig. 34), thus allowing for any expansion or contraction which would tend to the reduction of the boiler to junk, as is frequently the case

when such pipe is omitted. As a matter of fact, the water is supposed to rise only to the height of its source; to make sure that no unlooked-for spasm shall convert it into temporary activity, the end is turned down over the tank.

The supply pipe leaving the boiler makes the circuit of hot-water connections in the simplest and most direct manner—the shorter this may be the better. This system, as shown, performs a circuit of the connections and returns again to the boiler through the waterback. This keeps the water in constant circulation, and consequently makes it possible to draw hot water at once from the faucets without having to wait for it to run hot. Its only objection is in carrying hot pipes through the various rooms, which is not always desirable. Then, too, the wear and tear on these pipes is necessarily much greater than in a system where the circuit is not installed.

If it becomes desirable to discontinue the circuit, that is, to empty the boiler and the hot-water pipes, preparatory to closing the house for the season, the water is first shut off from the supply, and all hot-water faucets and the stop cock (s) on waste at the bottom of boiler opened wide. This will drain the entire system, mostly through the waste, and the air to replace the water will find its way to the boiler as the water recedes through the safety and supply pipes. Thus the safety pipe and the open faucets prevent the possible collapse of the boiler.

A large soapstone kitchen sink, well lighted and well placed. The utensils are conveniently arranged

It will be seen from the above brief description that it is the pressure that causes the delivery of the water, but it is the principle of heated bodies which causes the circulation of hot water and makes it possible to draw this rather than the cold.

Without going into the simple details of the necessary connections, it may be stated that it is possible to heat the water from two places at once or from either of the places. One system employs two waterbacks, in the kitchen and laundry respectively, and connected with one boiler in the former location. The other connects two simple systems with local boilers and waterbacks.

Cracking noises in the pipes and waterback and a rumbling in the boiler indicate something radically wrong, which may result more seriously than it

sounds. Such noises are more than likely to be caused by poor circulation, due to the following conditions: The connection between waterback and boiler may be sagged, as already explained. The waterback may be choked with dirt or sediment from the boiler. If not attended to as soon as discovered it is liable to become stopped up entirely, and then look out for flying fragments. There are two conditions attending the explosions of the waterback. With the connections stopped up and containing hot water, heat applied will generate steam, which, finding no ready outlet, makes one of its own. If it be dry (the water being turned off) and a fire be built in the range, the waterback may become red hot. You have only to turn on the water to see things fly, as the steam may often be generated too fast for the boiler's safety. Further danger lies in the freezing of the connections between the boiler and range. As the water may flow from both hot and cold-water faucets at the sink on a test, which would seem to be all right, it is always best to examine the connection before there is a chance for trouble.

The ordinary hot-water boiler is deficient in its construction, inasmuch as it allows the cold water to pass through the bottom, thus making the waterback connection a receptacle for sediment. The possible results from this source have already been noted, but if one is careful to draw off through the waste a fair quantity of water once every week one may rest easier on that score. A better solution of the problem would be the attachment of a sediment chamber to the bottom of the boiler, and making the connection to the water-back through the side of the boiler. This device is simple and effective, collecting the sediment and discharging it through the waste as desired. Like most labour-saving contrivances, it will not do the work automatically, but requires a little attention at stated intervals—say about once a month or so.

Although the boiler is sometimes of galvanised iron, it is true economy to use that made of copper, as it is more durable and easily cleaned.

The service pipe may be either of two sorts, galvanised iron or lead. The only advantage in the use of the former is its cheapness; no one will steal it. Its price is about one-third that of lead, the labour involved in its use about one-sixth that of the latter. It has several disadvantages, however, which are more or less serious. If the coating comes off, as it frequently does in bending or otherwise, the exposed pipe will rust. The coating process sometimes leaves rough surfaces on the inside of the pipe, which retards the flow of the water and forms a base for the collection of further obstruction. Being a hard metal, it will not stand the frost as well as lead, but is apt to crack. The principal ingredient of the galvanised coat is zinc, dangerous if taken into the system, and all the more so if the water be pure.

The lead pipe is perhaps on the whole more safe than the galvanised iron. When new, however, there is a slight danger of poisoning, especially when the water is perfectly clear. Ordinarily the slight sediment from the water forms a thin protecting lining on the inside of the pipe, thus stopping any action of the water upon it. Lead pipe is more durable than iron and easier to repair.

The tin-lined lead pipe, although serviceable for some purposes, requires to be put together by a first-class workman, as the tin melts at a lower temperature than the lead, thus causing complications. As the first-class plumber is not

An elaborate structure of brick and stone, modelled to a certain extent on French lines

A summer house built of the simplest and cheapest materials. Note the arrangement of gables

An excellent example of shingle work at Bar Harbor, Me. Andrews, Jacques & Rantoul, architects

Example of popular adaptation of English-stone and half-timber work. Baily & Truscott, architects

always to be gotten the experiment is risky, to say the least. Because the tin lining has no real hold on the lead, being simply pressed closely to the latter, it is apt to separate from it when the pipe is bent. This often results in a weak place which will burst sooner or later. When used for hot water this style of pipe is at its worst, as the unequal expansion of the two metals soon leaves the lining loose on the inside.

End of a first-story laundry showing the relative position of the soapstone tubs to the light

For use in the hot-water system the brass or copper pipe is without question the best; lead is too soft to stand the heat test, and wrought iron will rust rapidly. The joints used in the connections should be threaded; where union joints are used, they should be of the ground-joint pattern. Under no circumstances use a soldered joint. The initial expenditure necessitated by the use of brass or copper will be more than a saving, if we consider the repair expenses attending the use of lead or iron. In the exposed work, where the several pipes are put up together, they should be separated by at least an inch; or more, if possible.

In the adjusting of pipes that run horizontally or in another than vertical direction, brass may be hung by ornamental hangers or bands, at reasonable distances apart to avoid sagging. Lead should be run on boards placed for the purpose, and affixed to it by bands or metal tacks placed close enough to avoid any possibility of sag. The board support should be used in vertical runs of lead as well.

Hot-water pipes running horizontally should be inclined upward in the direction of the flow of the water. Never let it drop below the level unless you wish to stop or injure the circuit. Hot-water pipes should never be allowed to sag. The arrangement in all houses should be such that all the water may be drained from the system if so desired. Whether this be done by inclining the pipe or by a stop and waste is immaterial, although the former method should be employed if practical.

The sizes of pipe vary, but they are ordinarily $\frac{5}{8}$-inch for outlets, $\frac{3}{4}$-inch for hot and cold water supplies, and 1-inch for the main service pipe. The supply

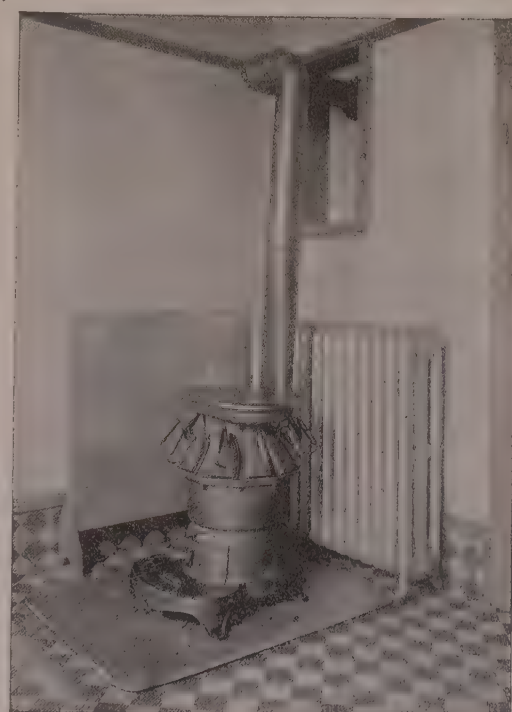
pipe from the attic tank may be as large as $1\frac{1}{2}$ inches, as the branches are numerous and the pressure low.

The stop cock is a shut-off introduced in a length of pipe to stop the flow of water. As it is usually necessary to drain the water from the pipe beyond the supply in case of repairs or to guard against freezing, the cock should be fitted with a waste. This contrivance allows the waste to flow back through an outlet in the cock simultaneously with the shutting off of the water. Thus it is necessary to provide a vessel of some sort to catch the waste. In some instances, notably where the flow of the waste takes a downward turn, with an outlet below, the waste cock is not necessary.

A stop cock and waste should be provided close to the entry of the supply into the house, and should be capable of draining the entire cold-water system. A plain stop cock should be fitted to the cold-water supply to the boiler near its entry. Other cocks may be distributed so that individual fixtures or groups of fixtures may be cut off without interrupting the main circuit; these are handy in case of repairs. Never put a stop cock in an overflow pipe.

A tank valve is an automatic cock used to control the flow from the supply pipe into the tank. It consists of a hollow metal ball attached to the end of an arm which is connected with the valve. The ball floats on the water; the lowering of the water opens the supply valve, by downward inclination of the arm; the water, rising, raises the ball, decreasing the flow until the valve is finally closed. If the valve be slow or weak, an increase in the length of the arm or the size of the ball will strengthen it.

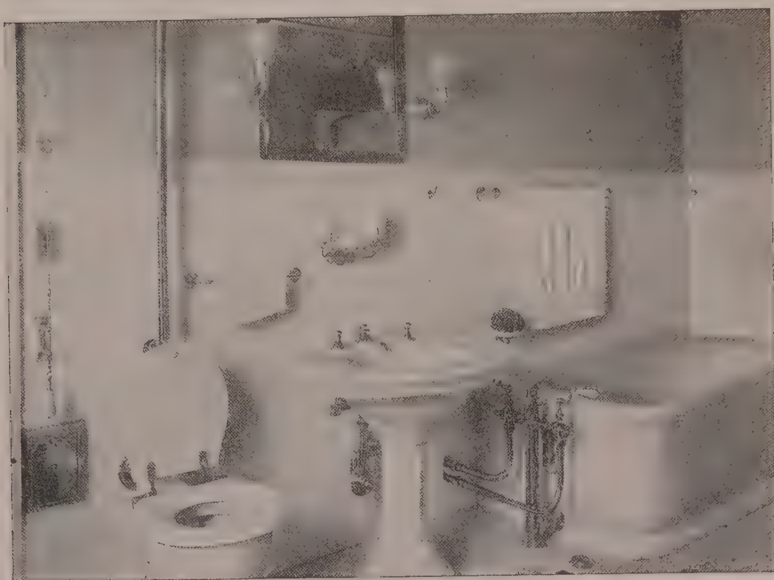
The old-fashioned make of faucets of the groundwork type is now little employed. It was similar to the common wooden spigot used for casks and barrels. The compression cock, the most common form to-day, although made in a variety of types, is closed by the compression of a sliding disk screwed down upon the valve opening; this disk has a washer affixed to it to prevent leakage.



A laundry stove for the heating of flat-irons

A variation of the compression cock is the self-closing faucet. In this a spring holds the valve on its seat when not in use, the application of hand pressure being necessary in order to get water. Such an arrangement prevents the dangers attending the leaving of the cock open. By the use of the above little Willie's pleasant pastime of spoiling ceilings is fortunately avoided. With the overflow the running water can do no damage, but the waste is a considerable

consideration. On account of the sudden change in the pressure of the water, and the construction of this faucet, it has one objectionable feature—that of vibration. When closed suddenly it is apt to jump, and the increase of pressure occasioned by closing some other faucet in the house will produce the same result. In this way the connections are considerably jarred, and its continuance is very likely to cause leaks.



A good example of modern bathroom, with porcelain fixtures, marble wainscotting, tile floor and simple accessories

The sill cock is a form of faucet used on the outside of the house for the connection of the garden hose. The branch leading to it from the supply pipe should be fitted with a stop cock.

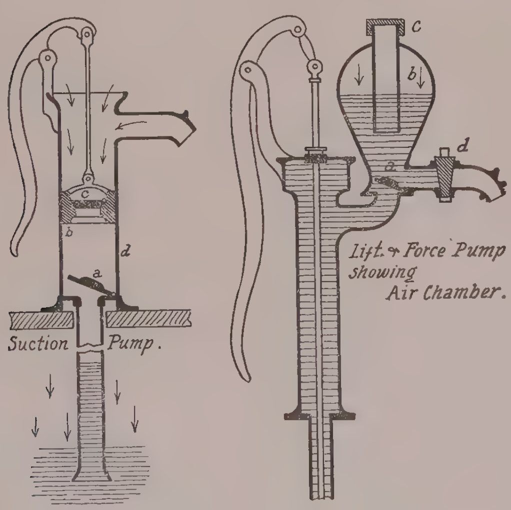


Fig. 36. Showing two types of pumps

The ordinary washer or packing for faucets is usually of leather or rubber. Hot water, however, soon takes the life out of these materials, thus rendering them worthless. For this purpose we should use an alloy of some sort containing brass; perhaps bronze.

The pump is made possible by certain physical laws. Nature abhors a vacuum; thus all space not otherwise occupied is naturally filled with air. A vacuum is a false condition in which a confined space contains nothing. The normal pressure of the air at the sea level is 14.7 pounds per square inch. This pressure is equally distributed upon everything alike. It is this pressure of the atmosphere which makes it theoretically possible to raise a column of water to a height of 34 feet by the use of the suction pump. The reason for this lies in the fact that a column of water one inch square and 34 feet high will weigh about 14.7 pounds, being equal to the pressure of the air on one square inch of surface. As a matter of fact, the

ordinary pump is not sufficiently tight to produce a perfect vacuum, therefore the height to which the water may actually be raised is somewhat below this. It is generally considered to be 25 feet.

The working of an ordinary suction pump is shown in Fig. 36. The plunger (b), fitting snugly into the cylinder (d), is moved up and down by means of the attached plunger rod and pump handle. By lowering the plunger the air in the cylinder below it is forced out through the plunger valve (c). The valve (a) remains closed in inaction, and also against downward pressure, opening only to pressure from below. By raising the plunger the tendency is to form a vacuum. The air pressing upon the top of the plunger finds no access to the space below, but that pressing on the top of the water in the well forces a quantity of water into the suction pipe to replace the air drawn out of it into the lower part of the cylinder. By the successive up-and-down thrusts of the plunger the air is exhausted from the suction pipe and the water, forced after it by the pressure of the outside atmosphere, is finally ejected through the plunger valve (c), and thus through the pump spout as it rises higher in the cylinder.


Portion of a bathroom showing a simple and tasty tile wainscotting

Thus it appears that this type of pump at first draws air and, having exhausted the air by suction, then draws water. If the working parts could be made perfectly tight, the amount of water raised at each full stroke would equal the cubic space in the cylinder below the plunger when that member is raised to the full height of stroke. This amount of cubic space, less the amount of water actually raised each full stroke, shows the amount of leakage.

The lift pump, like the foregoing, follows the same general principle, which is the same in all pumps. Its notable difference is in the location of the cylinder, which is submerged in the water at the end of the pump pipe. There is no air below the plunger to exclude, and hence the water is lifted by successive strokes through the pump pipe in the manner already described. Of the two, this type is the better working, owing to the parts being tighter, submerged as they constantly are, but it is more expensive and harder to get at in case of accident than

the suction pump, which has all its working parts above the well and within easy reach. For this reason the latter is the more frequently used.

For deep wells (say 150 feet or less) the lift pump with air-chamber attachment is excellent. This may also be used as a combined lift and force pump by the use of simple attachments (see Fig. 36). The air chamber should be used on all plunger force pumps, as it allows of a greater discharge of water in a given time, and also a more uniform flow of water, which is most desirable. In the section shown the pump can be used in the ordinary way by closing the pipe in the air chamber with the cap (c) and drawing water from the faucet (d), or by closing the faucet and connecting the aforesaid pipe with piping main to supply tank it may be used as a force pump. In this latter arrangement a stop cock is fitted to the pipe connection above the air chamber, so that the pump may be used either way desired. In cases of fire a hose can be attached to the faucet, and the water forced through it in the same manner as through the pipe.

The cut shows the operation of this style of pump. The water is at about the level in the air chamber that it would occupy while the pump was working and the air under pressure. Suppose the faucet to be open and the pump to be empty, the cylinder is supposed to be submerged in the water of the well, and, as is ordinarily the case with such pumps, is from 2 to 3 inches in its inside diameter, while the outlet of the faucet is 1 to $1\frac{1}{2}$ inches. We start the pump and the water gradually rises to the check valve (a), and, passing through it, finds an outlet through the faucet. Owing to the fact that the cylinder and the water channel above are of larger diameter than the faucet outlet, all the water cannot be ejected as the result of each upward stroke of the plunger rod. Therefore the surplus is forced into the air chamber, compressing the air (b) to about half its normal bulk. The downward motion of the plunger exerts no pressure on the water; rather it relieves it. Naturally the water would fall back, and were it not for the air chamber and valve (a) the water would cease to flow from the faucet. As it is, the compressed air (b) exerts the spring of its compression, the valve (a) closes and the water is still forced out of the faucet, and before the air chamber has been emptied a new supply has been brought forward. It will further be seen that as the flow of water is continuous air cannot pass back into the pump, and a consequent loss of power is avoided.

A double lavatory similar to one shown on opposite page

As the piping in such a well is naturally long, it should have some cross sup-

port at the bottom and perhaps in the upper interval, to keep it from vibrating and thus loosening the working parts. To protect this pump from freezing it is advisable to drill an $\frac{1}{8}$-inch hole in the pipe, some 5 or 6 feet below the supporting platform, so that the water will readily drain off to a safe level after use. This hole will cause but a slight loss of water and will save much annoyance and expense.

A simple porcelain lavatory with oval bowl

There are two kinds of attic tanks, the wooden, with metal lining, and the all-metal tank. The former is made of plank and usually put together with tie-bolts (see Fig. 37). There are but two linings for this worth considering, sheet lead and sheet copper. Lead was the first material used and lasts very well, but has gradually given way to copper and the all-metal tank. This is largely due to the poisonous qualities of the former under certain conditions. Lead well covered with water collects (as we have elsewhere stated) a fine sediment which protects it from corrosion by the action of the water, the real source of danger. If the water be drawn from the tank or in any other way the wet lead is exposed to the action of the air, then corrosion begins. In this alternate wetting and drying lies the danger; such conditions are likely to occur in one way or another; it is safer not to use lead.

Sheet copper should be lined with tin, as bare copper is even more poisonous than lead under such conditions. In large copper-lined tanks, owing to the limited sizes of the metal sheets, joints must of necessity be made. These joints may be of the sort termed double or lock seams, in which the two sheets of metal are turned into one another, hammered flat and then carefully soldered together.

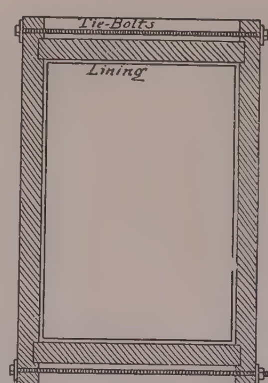


Fig. 37. Horizontal section of a wooden, metal-lined tank

Wooden tanks are sometimes made without lining, more particularly when of large size. In such cases, as in fact with all tanks, the tank should be slightly elevated and rest on a metal tray some 2 or 3 inches deep and projecting perhaps a foot beyond the tank on all sides. This, connected with a fair-sized drain, should protect the house in case of leakage.

The cast-iron sectional tank, as its name indicates, is made of separate adjustable parts or plates which are bolted together, using cement joints. The separate sections are easily handled and adjusted, owing to their comparatively small size. Its lasting qualities are good.

Every tank should have an overflow pipe attached to it a little below the top, to avoid any possible chance of flooding the house. It should be considerably larger in sectional area than the feed pipe, for the reason that water will not run from it with equal force to that of the higher-pressure supply. It should not drain into the sewer or its connections, as even with a trap the sewer gas would escape. The reason for this is that the overflow is merely a precaution and is not brought into play but at very rare intervals, thus any trap would become dry and useless. For this reason it should be carried to the outside air, as to the house gutter, or be brought down over some fixture, like a sink, which is in constant use. In event of its opening to the outside air, a fine screen of sufficient mesh to exclude possible explorers should be attached to the outlet.

Portion of a small bathroom showing a handy shower bath and a serviceable lavatory and mirror

The top of all tanks should be open for ventilation, and to prevent loose insects from committing suicide a thin cheesecloth canopy may be found to be of advantage. If this be so constructed on ribs that will not allow of its "bagging" on the top, it may be found an excellent screen for dust as well.

Under the head of "fixtures" we shall consider such accessories as washbasins, bathtubs, sinks, water closets, etc., but before doing this a word may be said on the subject of open plumbing.

The installation of the plumbing fixtures in the old way, that of enclosing everything possible in a wooden casing, should not be considered for a moment. Not only does it make the working parts extremely hard to get at in case of trouble. but it tempts the cheap plumber to dishonest work and aids him to perform it with little fear of detection. So soon as the sheathing is in place it is next to impossible to tell what it may conceal. The author remembers distinctly his experience in a little house just outside of New York City. The plumbing was of this type, and the first time the bathtub was used it was filled too full, so that on getting into it the tide at once rose above the overflow outlet. Visibly there was nothing wrong, but a protesting cry from the kitchen resulted in a hasty withdrawal from the tub, and an investigation elicited the fact that no overflow pipe had been attached to the overflow. It was not from neglect nor absent-mindedness that such an oversight occurred. It was a deliberately planned scheme on the part of the plumber to cheat his employer.

With the open plumbing the case is different; all the working parts are

visible, and the ordinary tests which might well pass over the instance cited would avail nothing here; the overflow pipe is plainly visible. Besides being easier to get at and keep clean, it is neater and far healthier. Water-soaked woodwork becomes filthy in a very short time; the invasion of the water invites other moistures and the adherence of much that is unsanitary. For this reason wood should be avoided when there is danger of its becoming wet.

When we meet the lavatory in ordinary life it is just plain "basin." The term originally meant "a place of washing," and as such it stands to-day. The common form is the porcelain basin proper, with the marble slab and back. This slab is supported by brackets, and the basin is fastened to the under side of the slab. This is not as good as the procelain article made all in one piece, although if the latter should become broken it means the replacing of the whole, whereas the former, being in separate parts, may be a less expensive job. The all-porcelain lavatory is supported either on one or more legs or on brackets, as one desires. It is probably the experience of everyone that a leg of any kind is continually in the way. Perhaps if our own were modelled on other lines and had less turned up in front for feet there would be a saving of trouble on the whole. As it is, it would seem that the bracket support for the basin were the better and more satisfactory choice.


Tin-lined copper sink in butler's pantry, well lighted and convenient to cupboard

Every basin should have an overflow as well as a drain in the bottom to connect with the waste. The drain is closed by a stopper, but the overflow should always be unobstructed (see Fig. 38).

The lined wooden sink being decidedly out of date, there is no use in considering it. The enamelled-iron sink gives a strong base, with a smooth finish easily kept clean, and is excellent for anything but the kitchen or where heavy pots and kettles are to be used. The enamelled coating cracks and chips easily when things are dropped in it.

The porcelain sink is another sanitary perfection which is ill adapted to hard knocks. For the lighter work it is excellent, but for the kitchen the aforesaid pots must be reckoned with. The soapstone sink

is excellent for the kitchen, and a recognised favourite. It absorbs neither moisture nor grease, nor is it affected by acids. Its colour is also in its favour.

The ordinary cast-iron sink, if properly cared for, is as good as any. It requires oiling occasionally, and with this precaution gives much satisfaction. The galvanised one, although supposed to be superior to the iron, is apt to show spots, and is not on the whole absolutely rust proof, although it is much used and seems to give satisfaction. The vegetable sink is a handy accessory to a large kitchen. It is usually of porcelain and consequently easy to keep clean.

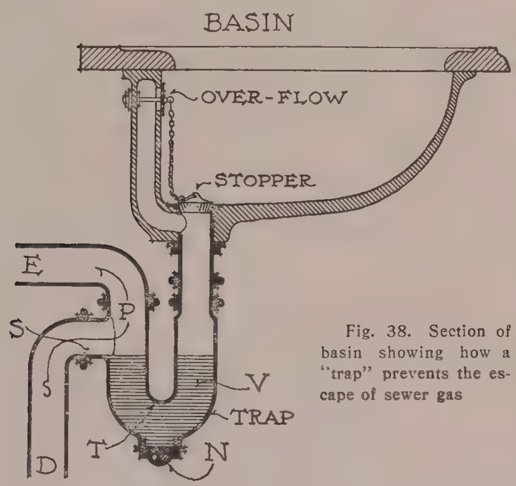


Fig. 38. Section of basin showing how a "trap" prevents the escape of sewer gas

The best manner of arranging the sink is to make it perfectly free, without any closets under it. It should stand on iron legs or brackets, as the case may require, and the closed-in closet may come under the dish drainer and slabs on either side of it if desired. Even this last may be objected to by the extremist, and perhaps with reason, but there must be a place to stow away some of the necessary kitchen miscellany (unless we adopt the French system), even if the bold and saucy cockroach hies himself to its inviting depths, much to our annoyance and discomfort.

It would be well to insist that the place for the laundry is not in the kitchen. When it becomes a mix-up between the soiled clothing and the lunch we draw the line for self-protection. The laundry is best and most convenient if located on the same floor as the kitchen, but conditions more frequently relegate it to the depths of an ill-lighted cellar.

Naturally the soapstone tub suggests itself first, as it has been long on the market and has given evident satisfaction. Its advantages are the same as those of the soapstone sink. They usually come in twos and threes made up together, and are set on iron legs.

The porcelain tub is perhaps better than the above for several reasons. It is made singly; thus as many as one wishes can be set up side by side. It also has rounded corners and interior angles—another advantage. All tubs should have waste and overflow pipes, as the principle is that of the lavatory or basin. The old-style bathtub, of wood and copper lining, has long ago passed into oblivion, and the afore-mentioned lining made to line the pockets of many a small boy, doubly glad that he was alive. We now have the porcelain and enamelled iron to choose from, and of the two there is probably very little difference as far as general utility is concerned. Manufacturers of the best enamelled ware claim that their product is better than porcelain for several reasons: Its cost is about one half that of the latter, besides being about one half the weight. It will not crack or chip with ordinary use. The porcelain tub absorbs heat and hence requires hotter water.

Bathtubs are made in many patterns and sizes; some set on legs and some

directly on the floor. Of these the former are better for obvious reasons. They are all provided with waste and overflow, as well as hot and cold water. In placing the tub in the bathroom it is well not to set it under or with back to the window, although it may face it. Whatever its location, it should be distant.

The shower bath, as ordinarily used, is placed over the bathtub, and consists of a shower or sprinkler at the top, with an enclosing curtain to keep the miniature rain storm where it belongs. A simple form of this may be had for from $18 to $20. Sometimes it forms an independent feature with a basin of its own, but the former type is the most used, as it is cheaper and detracts nothing from the tub, while the latter takes up extra room of its own.

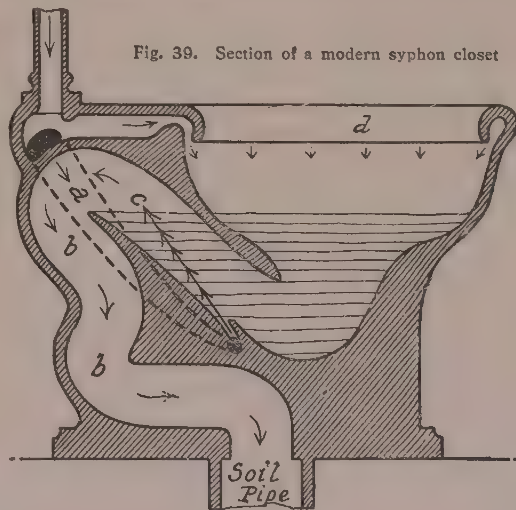


Fig. 39. Section of a modern syphon closet

It is needless to waste time describing the ancient "pan" and "plunger" closets. Both are practically obsolete; and our present needs require the best that is to be had. The old "washout" closet is a decided step in advance, but as it holds very little water it easily becomes foul, and hence the source of bad odours, nor does it wash out as its name implies. The three foregoing types were natural steps toward the present form.

The best article on the market to-day is the "syphon" closet. It is made in numerous patterns and differs slightly in some details, but its general principles are the same. This style is made so as to hold considerable water in the bowl, both of which (the water and the bowl) form a natural seal or trap which prevents the gases from escaping through it from the soil pipe. The bowl is flushed or emptied through the medium of a discharge of tank water, which, either by its own action or the supplementary one of air, creates a syphonic action which empties the bowl and at the same time refills it with clean water. Take, for example, the style shown (Fig. 39). From the construction of the bowl and the normal position of the water, it is readily seen that sewer gas cannot escape through the seal thus formed. To empty the bowl the water is released from the tank, which expels the air in the supply pipe and in the two canals (a) which pass either side of the long syphon limb (b) into the water at the back of the bowl in such a way as to take an upward and backward turn (c). This starts the syphon in the trap, and the water which follows it completes the work. At the same time a limited flow of water is filling the bowl through the flushing rim (d). This slow flow of water allows the air to get in between it and the discharged water, thus breaking the syphon and allowing the undisturbed refilling of the bowl. The passage of the discharge down the syphon limb and soil pipe forms a temporary seal until the normal seal is completed in the bowl. Another form ejects by a downflow of water the air contained in the syphon limb and several air chambers attached in such a way as to induce a vacuum and cause the syphonic

action. Each closet should have a separate tank of its own, used only for the individual needs of such fixtures. This is important, as with the single tank one breakdown may hold up several closets.

To remove local odours, a "local vent" should be attached to every closet above the syphon. This, to be effective, should connect with the kitchen chimney flue or some other medium of heat, which should induce a draught at all times if possible. It should not open directly into such flue but be carried up inside it to the top in a 2-inch iron pipe. If such a connection cannot be made, a special heat should be provided to induce a draught, and never should the local vent rely on natural draught or be connected with the soil ventilating pipe. This is often done, but it is exceedingly risky.

In some houses a special "slop" closet is provided, so that the chamber work may not interfere with the bathroom. In this is set a slop sink, which is a deep sink very like a laundry tub, having water cocks and waste with no stopper.

The complete bathroom varies much in cost owing to the style of fittings employed. Such fittings as the tub, closet and lavatory or basin (unset), in a good quality of enamelled iron, may be had for $75. Adding a shower bath to the above, the cost would be about $100. In porcelain the bath, closet and lavatory might cost about $170. The more elaborate affair will easily spoil the commercial value of a thousand-dollar bill.

If one has a cold-water system in the house and wishes to install a bathroom and hot-water system, he can get an enamelled tub and closet, a porcelain bowl and marble slab, copper tank, iron sink and two soapstone tubs for laundry for about $300, the whole set in the best manner, simple and complete.

Having considered the supply system and its fixtures, we will now turn our attention to the disposal of waste. This is effected through iron pipes, the larger of which, called the soil pipe, constitutes the main artery of the sanitation system. Naturally the various fixtures connect with this in various ways, which we shall consider later.

When one looks at the sanitation drawing for an average house within the limits of our bigger cities, one is struck by its apparent complication, and, when one considers that this is but about half the plumbing problem, it looks more than ever like a plumber's dream of perpetual bliss. But this is not all a dream; it is a reality made compulsory by the building laws of most of our chief cities and even lesser cities. How the plumber must have smiled when this law made the amount of work on the sanitary system nearly double what it was before. Yet this law was intended to remedy an evil—with what result we may judge.

We have already stated that the sanitary outlets were through the soil pipe and its branches, but, having disposed of the wastes in this manner, we are still confronted by the problem of the rising sewer gas, which would find unobstructed outlets through the open waste connections. To obviate this the trap was invented. This consists in a certain form of pipe, or attachment, designed to hold a small quantity of water at all times, so that the escape of the aforesaid gas may be absolutely checked.

The common form was the "S" trap, which was merely the reverse bending of an ordinary pipe (see Fig. 40). As the water was poured from the

receptacle above it overflowed the bend, and was supposed to leave enough water at all times to keep the seal closed. There are two things, however, which menace this—evaporation and syphonage. As every trap has more or less connection with the air, unless it be used at frequent intervals the dangers from evaporation are great. This is particularly noticeable of a house standing idle; its traps require immediate attention when it is opened. A considerable flow of water is apt to syphon the trap, there being no interval of air to check it. It is this fact which was at the bottom of the vent law, which was to the effect that: "All traps must have a vent pipe of suitable size connected at or near the crown of the trap, and extending either separately up to the roof or connected with the soil-pipe line above the highest fixture." The back vent is a remedy against this evil, but it is claimed by some that it involves other evils of its own. How this back vent works may be seen in Fig. 38. As long as the water maintains a level above the point T no gas can escape, and its normal condition is that of V, which forms the water seal. Water flowing from the basin raises the level of the seal above point S, causing it to overflow into the waste pipe (D), and if the amount of water be considerable and there be no back vent syphonage is liable to occur, as already stated. With the back vent (E), the water receding from the crown of the trap (P) is followed down the waste by the air, which breaks the syphon and leaves the seal at its normal height.

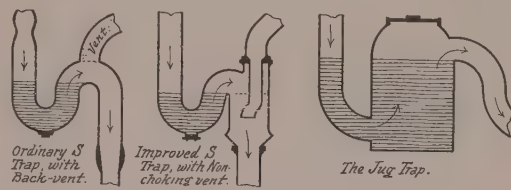


Fig. 40. Section showing three simple trap forms

Even this trap is not altogether sure, as the vent pipe may become choked with grease or other matter so as to become useless. To obviate this an improved "S" trap has been devised (see Fig. 40). The "jug trap" shown in the same cut is an unvented lead contrivance, which is reasonably safe from the fact that the bulk of the water held in it is hard to syphon.

In order to avoid the extra expense of piping occasioned by the back-vent system (see Fig. 42), the manufacturers have placed on the market several so-called non-syphoning traps (see Fig. 41). A consists in the use of a glass globe through which the workings of the trap may be seen. B has a glass bottom, and the rubber ball, while driven downward by the outflow of water, resumes its position as this ceases and closes the mouth of the pipe. This is supposed to break the syphonic action and also to prevent the backing up of water from the waste pipe. C and D have extending "lips" which are supposed to cut the syphonic flow. All traps should have a clean out (generally located in the bottom) so that solid matter may be removed when necessary. It is well to inspect these frequently.

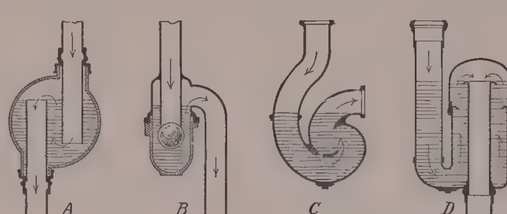
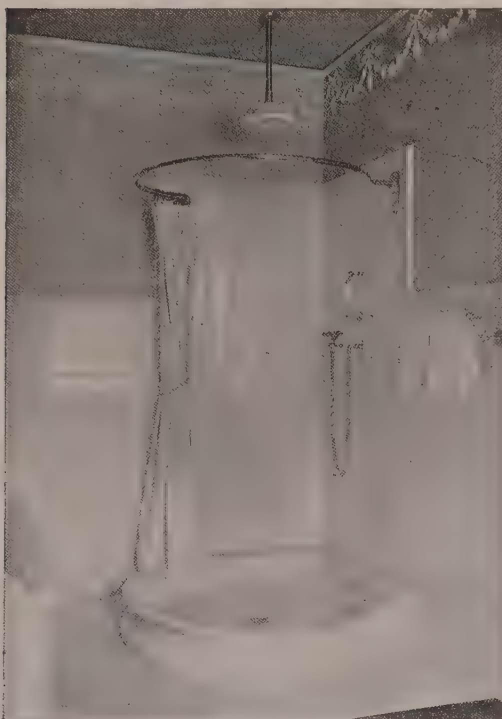


Fig. 41. Types of the non-syphoning trap

The grease trap is a special form of trap used for kitchen sinks, which prevents the hot grease from getting into the main and in hardening choke the passage.

This is an important feature and should be borne in mind. Traps are usually of the following sizes: For water closets, about 4 inches; for slop sink, kitchen sink and washtubs, 2 inches; for other fixtures, $1\frac{1}{2}$ inches.



A shower-bath with porcelain basin and marble back in continuation of the wainscotting

Having considered the trap, let us look at the more complex system as necessitated by some local laws (see Fig. 42). The main soil pipe (A) is of iron, 4 inches in diameter, and extends from the house drain below the cellar level straight upward through the roof. The main waste pipe (B) is erected in the same manner and serves the same office for the liquid wastes. It varies in size from 2 to 3 inches, according to the number of branch connections, and may be omitted in favour of the main soil pipe in a more condensed system. The main vent pipes (C) run parallel to the two foregoing as closely as possible and join them above and below the fixtures connections at X and Y. Connected to these two mains are the branch waste pipes (D) and the branch vent pipes (E), the former of which is attached lower and the latter higher than the fixtures from which they lead. The branch waste should have at least a pitch of $\frac{1}{4}$ inch to the foot in its flat run. Where the closet is removed to a short distance from the main soil pipe, it is connected to the Y by a short length termed the branch soil pipe (W), which should have the same pitch as the branch wastes. Where it is possible, the branch wastes and vents, as well as house traps (J) and the intersection of the mains with house drain, should have clean-outs with screw caps conveniently located.

It will be noted that traps are attached to all fixtures except the closet (which is its own trap), and each trap taps both the soil or waste and the main vent. It is not absolutely necessary to back-vent the closet, although this is done to cover the law.

The house drain (L) has the usual pitch of branch waste pipes, and connects with the mains through Y joints inclined toward the pitch of the pipe. The trap (J), located just inside the wall of the house through which the house drain passes to connect with the sewer, prevents the entry of gas into the house system from the outside. Back of this trap is attached the fresh-air inlet (I), which, from its frequent tendency to serve as a vent, should be located well away from the house. On the opposite side of the house the cellar window area is drained by P, and the leaders from the roof with this pass through the house

wall and tap the house drain. This connection is protected by a trap, a precaution which should always be taken in like cases where the house drain is thus entered.

The waste from the refrigerator should not enter the house drain, as it adds one more possible source of trouble, and is not at all necessary, as the water discharged is harmless. It should empty into the cellar sink, and may be connected with the overflow pipe from the attic tank if convenient.

The system which avoids the use of the back vent and relies on the non-syphoning trap as a protection, is shown in Fig. 34. As the ordinary country house may connect with a cesspool, usually located at the back of the house,

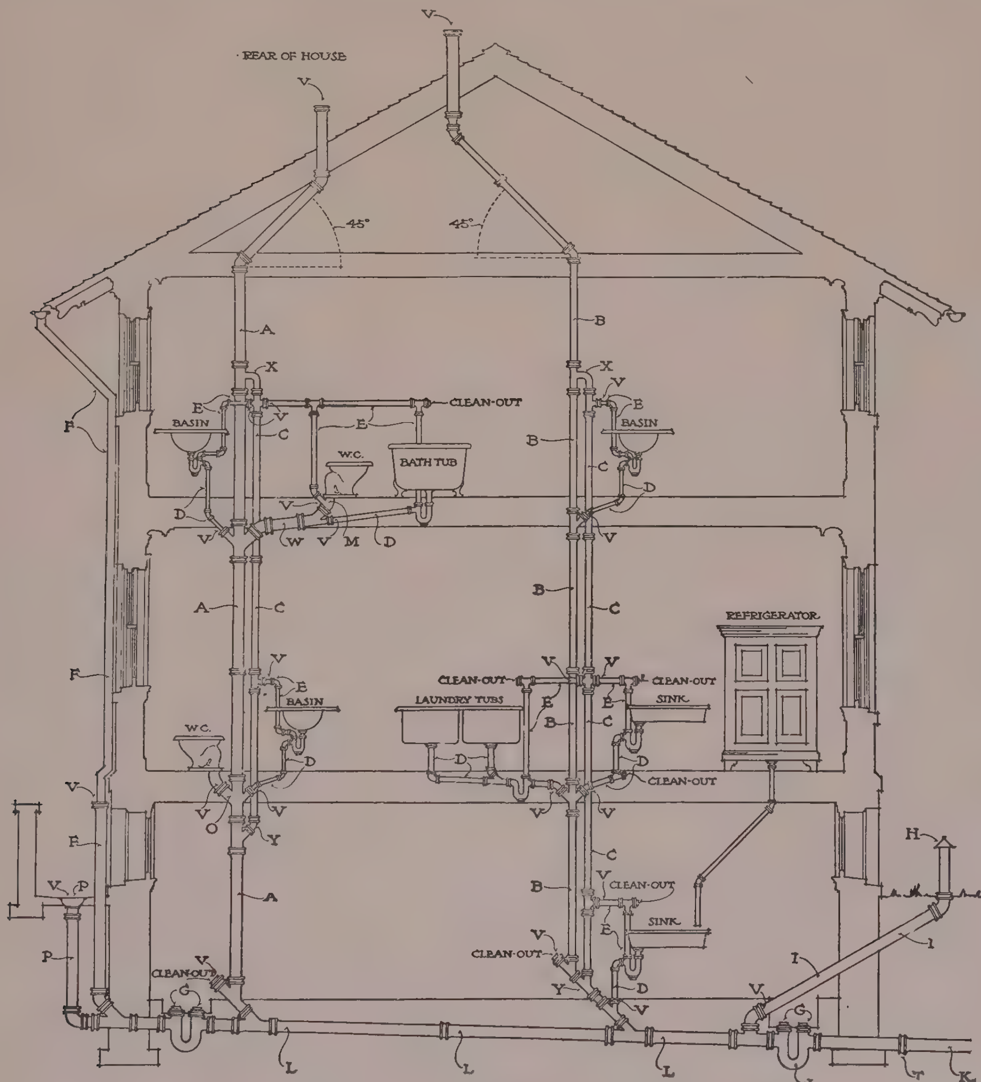


Fig. 42. Section showing the installation of the back-vent system

A. Soil line	D. Branch water pipes	G. Removable tap screws	J. House trap	M. Branch soil	T. Mouth of house drain
B. Main waste	E. Branch vent	H. Cap	K. House sewer	N. Screw cap	V. Water seal
C. Main vent	F. Rainwater leader	I. Fresh air inlet	L. House drain	P. Area drains	W. Branch soil pipe

where are also the kitchen, laundry, bathroom, etc., the house drain is practically non-existing in many cases. It has the same arrangement in its connections, excepting that each branch waste taps the soil main independently. This soil pipe is carried through the peak of an attic dormer and then hooded, both to protect it from the weather and to hide its ugly length of painted iron.

This system has a strong advocate in Mr. William Paul Gerhard, C.E., who believes in the simplicity of plumbing and considers the back-vent system a needless waste of money and incurring of new risks. In his interesting pamphlet, "Plumbing Simplified," he says: "Branch pipe ventilation is carried much too far; that instead of giving positive security, it creates new and sometimes serious dangers. . . . It increases the number of pipe joints . . . and therefore increases the danger of leakage at the joints. . . . Trap vents attached to the horns of porcelain fixtures, such as water closets, often lead, in case of settlement of the building, to the leakage of the horns, thus opening up a dangerous inlet for sewer gas, the crack often remaining unnoticed for years. . . The trap-venting system affords increased opportunities for by-passes in case of careless or ignorant workmen."

An enamelled kitchen sink with hot and cold water and trapped waste. The overflow or waste which empties into it is after the manner of the ice-chest waste

He also offers several points to be observed in the installation of the simpler system, viz.: "(1). Always avoid those conditions which form syphonage. (2) Do not make soil pipes too small. (3) Never join small branch wastes together, but give each an independent outlet into the larger waste or soil pipe. (4) Avoid all long dead ends. (5) Use traps or trap devices which maintain a water seal under all ordinary conditions."

Mr. Gerhard is not the only advocate of this system; the manufacturers and even the plumber admit its good working qualities. As on any other question there are two sides, we find those for and those against it, and we regret to say that many of the latter have nests to feather.

The whole thing, however, seems to hinge on the non-syphoning trap; some affirm, others deny, its existence. When the owner is left any choice between the two systems, and is in doubt, we can only advise that he convince himself one

way or the other as to the absolute effectiveness of the non-syphoning trap, and choose accordingly. As it is still, unfortunately, an open question, this is the best advice we can give.

The rough piping is of wrought or cast iron, as the case may require, and galvanised or painted for its protection. Lead is still used to some extent for small pipes, but its expense is an item to be considered. Exposed pipes both for waste and supply should be of nickelled brass, as is all other exposed metal work.

The sizes of pipes are usually as follows: Main and branch soil pipes, 4 inches; main waste pipe, 2 to 3 inches; branch waste pipes for washtubs and kitchen sink, 2 inches; for other fixtures, $1\frac{1}{2}$ inches; main vent pipes, long branch vent pipes and branch vents for fixtures with traps larger than 2 inches, 2 inches; branch vents for fixtures with traps 2 inches or less, $1\frac{1}{2}$ inches. The inside dimension of the outside sewer pipes should be 6 inches.

It is best not to seal up any pipe in a partition or flooring; there should be some way of getting at it in case of necessity. It may be by means of wall panel, false pilaster or beam or floor trap, but it should exist.

Having completed the system up to the point of connection with fixtures and sewer, it is necessary to test it, to prove to one's satisfaction that no flaws exist. This should be done by the "water test." To effect this, all openings but the top of the soil pipe at the roof should be closed with patent pipe closers and the system filled with water to the top; the detection of leaks is then an easy matter, and such should be carefully repaired and again tested; repairs and tests should continue until absolutely tight.

When the system is complete and ready for final acceptance it should undergo another test, the "peppermint test." Essence of peppermint having been mixed with a pail of water, the mixture is poured down through the soil and vent mains from the roof, using a bucketful for each main. Someone who has not been near the peppermint or its mixing should then go carefully over the entire system to detect any odour which may leak through after the application. If repairs have to be made the test should be repeated after each attempt at rectification. A satisfactory tour should detect no odour, hence the work, as far as its tightness is concerned, should be accepted. Under no circumstance should the peppermint be brought into the house, as it will permeate everything and render its usefulness void. Care in this direction may save much trouble and loss of time.

House at Merion, Pa. Gothic design in random, quarry-faced ashlar. Wm. L. Price, architect

Nearly concealed by cedars and ampelopsis. This storage tank is enclosed in a shell of rough field stone. How different from many of the ugly tanks that disfigure the country

CHAPTER XIII

Water Supply and Drainage

PROBABLY no two questions are of more importance to the house builder as an individual or more momentous to the general public than those of water supply and drainage. Their seriousness is realised when one considers the various mammoth public systems which have been constructed in various parts of the country.

It should be understood at the start that, though the more simple problems may be taken in hand by the owner, yet more complicated cases require the services of an expert. It stands to reason that any problem, whether simple or complex, is better for professional supervision, but often the purse will not allow of this. There are many firms that make a business of the water supply and sewerage of the country estate, furnishing expert knowledge and necessary labour. We generally think of a community numerous enough to have public service as being condensed into a comparatively small land area per family. On the other hand, in a locality where the public service does not exist, we expect to find more land to each estate, giving the private individual more room to manœuvre. It is a mistake to build a large house on a small lot under the conditions of the private system; they are rarely perfect.

The most difficult situation is that of the transition stage, in which the community has in reality outgrown the private system. Parties locating in such

a place should secure land enough to protect themselves against outside contamination. Although the first outlay may be more than the individual cares to carry permanently, yet as a safeguard it is worth its price, and further disposal can be planned for and consummated at such time as public service and the increase of taxes and land valuation make it advisable.

Of late years the importance of these two has been more and more realised. The engineer makes them his especial study, and the inventive mind turns more and more to mechanical contrivances for their perfection.

Water in its normal state consists of two parts hydrogen and one part oxygen gas. These two gases in combination lose their gaseous form and become at once a new substance. This is no sooner in existence than it loses its normal condition by the absorption of foreign matter. Leaving the form of vapour and changing into rain, it absorbs from the atmosphere such purity or impurity as it may contain, and falling on the earth and filtering into it draws in turn from this source such properties as it may dispense. Although water absorbs impurities, as we have already stated, it also purifies itself by filtration through cleansing soils, which in turn take up the infectious matter.

As the modern public service is usually constructed under the supervision of a competent engineer, it is fair to assume that it will be perfected as far as knowledge and skill can carry it. Much depends upon the natural resources, and even the most skilful engineer is limited in the entire success of his undertaking. A system may be complete and draw upon water that is, owing to existing conditions, not of the best. With this in mind, it is well for the prospective purchaser to go over the ground thoroughly and assure himself by personal inspection and expert analysis that he is perfectly safe in this direction.

No country house is desirable as a residence, either permanently or temporarily, which has not at least a good well or an unfailing spring of pure water handy, and in such a position as to be free from all danger of contamination by surface water flowing into it, or by impurities reaching its source through porous soil strata.

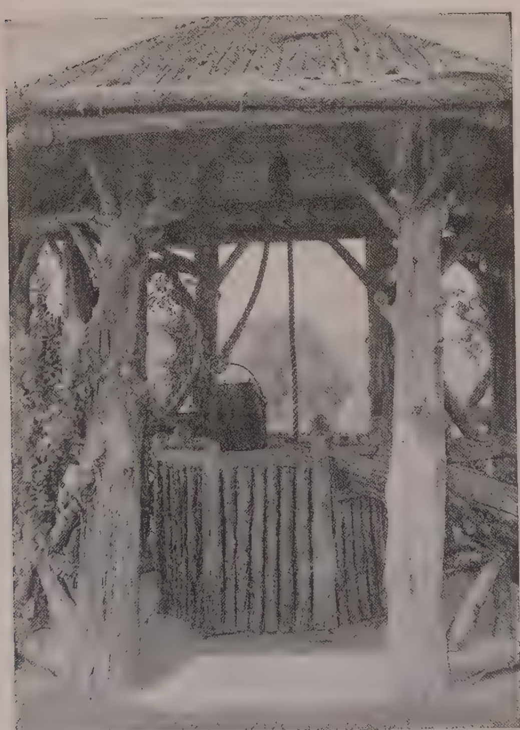
The first action of the water falling upon the earth is, in obedience to the laws of gravity, to seek a lower level. This it does by flowing over the inclined surface, or by filtering through porous soil. After leaving the surface of the ground it proceeds until it strikes some impenetrable strata, over which it flows seeking an outlet. Commonly it is this water en route which is the source of supply for the ordinary well, although springs are struck frequently in well digging and the existing spring is converted into a well by excavation.

Water flowing over an impermeable stratum often reaches a pocket or basin, which becomes filled and thus causes the water to seek an outlet through the surface of the ground. Thus springs are formed. Large springs or small ones in sufficient number, coming to the surface in natural land basins or valleys, form ponds and streams. These also receive water from the various watersheds, much to the detriment of their purity.

It is difficult to judge of the quality of water and its fitness for drinking or general domestic use from the mere facts of looks and taste. A person with no knowledge of chemistry should not attempt to settle this question. It is always

best to have it analysed by a chemist who is familiar with such work. Water has been taken from some of the juniper swamps of Virginia which, while decidedly doubtful as to looks and taste, proved to be perfectly healthy and harmless, while numerous examples of clear, cool, sparkling water contained poisonous qualities of the most dangerous sort.

As far as tangible impurities are concerned (and by this we mean those that are unsightly rather than dangerous), they can be eliminated by the use of charcoal or iron-stone filters. These filters should be cleansed frequently. Although slightly impure water may be filtered, it is not best to trifle too much with it. Your chemist will at once tell you what you have to deal with, and a source of excessive impurity should be abandoned. It is more with the knowledge that contamination may occur after the supply system has been working perfectly for a considerable time that we speak of the filter at all. Purification by any other method than filters should be done by one understanding chemistry. This being the case, its claim on one's attention is brief.



Detail of the rustic well house at Newburgh, N. Y.

The well is a shaft by which water-bearing strata are reached. Wells are of three kinds; viz., dug, bored or artesian, and the driven or drive well. The ordinary well of the country farmhouse is located midway between the kitchen sink and the pigpen, with a preference one way or the other as the case may be. From one or both of these sources of filth the well receives more or less contagious matter until something happens. The remainder of the family are consoled with the assurance that it is the will of the Lord. Later the "Lord" claims more victims, and all is still. Religion is a beautiful thing. It seems, however, decidedly out of place and a shirking of responsibility to lay the deadly workings of a filthy well to the Almighty. Of course it is far easier to assume that it is His wisdom than to take the trouble to ascertain that it is one's own consummate stupidity. There are those who awake to the truth after the evil is done, but how much better would it have been to have taken proper precaution and averted it in the beginning.

The fact that the well is separated from the sink drain and the barn by a considerable distance means nothing more than that the evil may be merely delayed. There are cases, it is true, where wells under such conditions have remained pure for years, and are, for that matter, still pure, but that is not the fault of the builder; it is just pure unadulterated luck—nothing more.

The ordinary farmhouse, as you will remember, sits on a side hill toward the road, with the barn in the rear and on higher ground. This is the usual formula, although it may be reversed, much to its credit and safety. It does not follow, however, that the general slope of the land follows in any way the impervious under stratum, although it has that tendency. It may, on the contrary, pitch in exactly the opposite direction; the earth's strata do queer things. It is for these reasons that it is advisable to make some definite investigations as to the general character and geological conditions of the proposed building plot. Besides digging and levelling, it is possible to get much aid from the Government geological charts, if any of the locality in question exist.* Of course these do not cover the entire country by any means, but rather that portion which is old in formation or interesting from a geological point of view. On general principles, it is best that the well be located on as high ground as is possible and the cesspool on the lowest.

A rustic well house at Newburgh, N. Y.

The common open well, excavated by digging, originated back in remote antiquity. Some of these old examples are most remarkable, extending to great depths, often through solid rock, with winding pathways descending spirally to the water level. Often these pathways are of sufficient width to admit of the passage of a donkey or a horse. Joseph's Well, at Cairo, Egypt, is 297 feet deep.

In most localities water can be easily obtained within a fairly reasonable distance of the surface. Ordinarily the depth at which a water-bearing stratum may be reached does not exceed 20 or 30 feet. In case of the wells being dug on

* These sheets can be procured from the Director of the United States Geological Survey, Washington, D. C.

a gravelly knoll or where the formation is such as to bring the water-bearing stratum farther from the surface, the depth of 80 feet is often reached.

In selecting a site for the well there are two sources of contamination to be borne in mind, surface drainage and subsoil filtration. The ordinary hole in the ground is very liable to become, under ordinary circumstances, a catch basin for surface drainage, to say nothing of the impurities that find access to it through the subsoil. For the above reasons it is absolutely necessary that the location of the well should be as far as possible from barnyard, privies, cesspools and all other possible sources of contamination, not only your own but those of your neighbours. Be sure, too, that the location be in the uphill direction. Where the lot of land is small or the buildings crowded together, the well problem becomes a most difficult and serious consideration. Not only is it close to the local source of contamination, but the extreme handiness of the neighbour and his little problem makes this all the more complicated. Simple filtration through permeable soil will reduce a certain amount of impurity for a limited time, but as the soil is soon likely to become clogged and choked with it, this is no absolute safeguard from pollution. It is readily seen from this why a good well may become suddenly affected from various causes which may have been operating without apparent effect for years.

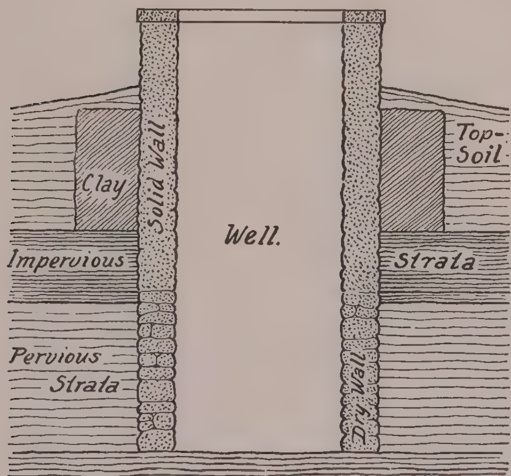


Fig. 43. A sectional diagram showing a well dug through impervious strata to pervious water-bearing strata below

As a rule, wells sunk in sand lying over an impervious stratum, especially clay, if not of considerable depth do not afford much water. Often a fair quantity may be obtained, but the quality is very apt to be bad. This is due in a measure to the extreme porousness of the soil and its tendency to absorb surface water with but little chance of effective filtration before it reaches the impervious stratum. The best wells are those which are sunk through impervious strata to pervious ones below. The water in quantity and quality is generally excellent. If such a well is properly constructed, it should eliminate all chance of contamination from surface water and many of the chances of menace from other sources. An effective method of construction would be to lay the well below the impervious stratum dry and the portion above and through the impervious strata in Portland cement, carefully pointed inside and thoroughly plastered outside. To re-enforce this a bank of clay may be added, care being taken to see that it is properly "puddled," or, in other words, pure clay is filled into the trench about the well in small pieces and in small quantities at a time. In the intervals the clay is "puddled" by adding water, which tends to soften and reduce it to a solid, compact mass. This bank of clay, together with the tight wall, will prevent surface water from entering (see Fig. 43).

The well which is sunk through pervious strata should have a tight wall to the depth of the outlet of supply. Often brick is substituted for stone, such being laid fairly thick—say 12 inches at the least. It is doubtful if it has any other advantage over stone than that of presenting a smoother surface; hence it is easier to clean. As this last consideration is of considerable importance, the brick-lined wall is worthy of consideration.

In the case of all wells the masonry should be carried above the grade, to allow for the making of a slight pitch away from it to shed the immediate surface water. Nor should there be any permanent woodwork inside a well; its tendency is to attract and shelter animal life, as well as to affect the water by decay. A well is usually round in construction; this form, receiving the equal pressure of the soil on all sides, is less liable to collapse than any other form. Wells should be covered to protect them from falling refuse and dust, but they should at the same time have ample ventilation.

It is impossible to give any hard-and-fast rules to govern the locating of a well, but, as already stated, it is an advantage to have it on as high ground as may be practical, that the danger from surface inflow and substrata infection may be lessened. If your neighbour possesses a good well, something may be learned from that, perhaps, and if it be located near your line and water is plentiful, it is not a bad idea to locate near it. Sometimes a spring in close proximity to your land, either above or below it, may be intercepted by a well. In such a case, if the water be good, your problem is solved. If there be no visible evidence to go by, the only thing to do is to steer clear of neighbouring cesspools and dig. The chances are that you will strike good water.

Windmill on farm of Thomas W. Lawson, Esq., at Egypt, Mass. It modifies the Dutch type, and the difference will be emphasised by the growth of the Crimson Ramblers. Cost about $3,500. Coolidge & Carlton, architects

Wells require considerable care

and attention; they do not take care of themselves, although they are generally left to that fate. Anything falling into them should be removed at once. They require frequent cleaning, as filth accumulates rapidly. The slimy matter found frequently adhering to the inside of wells is a true fungoid growth, which is active poison when taken into the system.

To the end that the well and general health be near perfection, it is best that all animal or vegetable matter should be cleaned from around it and composted at some distance off. The immediate vicinity of a well should be kept clean.

The well offers excellent chances for artistic treatment. Many of the old Italian well curbs are very beautiful. There is a chance, too, in the old-fashioned well sweep. Where old models are followed it is well to bear in mind the general principles of cleanliness and utility, and these, according to modern ideas, require more or less modification of the originals.

The cost of a well varies so much under differing conditions that it is impossible to give any definite figures. It depends upon the size, depth, character of soil, the price of wall material and cost of labour. The average well, under favourable circumstances, might be built for from $50 to $75.

Where it is necessary to go to greater depth than the ordinary limit of the dug well, the artesian well is resorted to. This is bored by special machinery and expert labour, and is rather costly. Of the large number of wells of this sort, the majority yield abundantly, although the objection lies in the difficulty of striking the right sort of water. Owing to the fact that the rocks of the paleozoic series extend in a nearly horizontal stratum over most of North America, the geological structure is very favourable to this sort of well. In form it is an ordinary open well dug to the depth of the impervious stratum. This stratum is bored through and the boring continued until a water-bearing stratum is reached. The water then rises through the boring into the well, which acts as a cistern. The cost of this well is usually reckoned at $6 per foot for a depth of from 200 to 300 feet. As the depth increases so does the cost, so that for a depth of 600 feet $7.50 per foot is reckoned.

The driven well is a small and home-made edition of the artesian system. It consists of several lengths of piping which are connected one to the other as each is driven down. The entering length is provided with perforations near the end for the admission of water, and is tipped with a sharp point or shoe.

Under ordinary circumstances, the best way to drive them is with a sledge hammer, but if this is used directly on the end of the pipe it is apt to splinter or destroy the joint. This is easily provided against by the use of a short piece of joist, through which and near one end a framing spike has been driven. While one person holds the joist over the end of the pipe, with the spike within the bore, another can use the sledge without much danger of damaging the connection. The object of the spike is to prevent the joist from "jumping" or sliding off. An iron jacket or collar comes for this purpose, which is screwed on to the pipe; being thus firm, it is apt to injure the threading in the shock of the blow.

In light, open soil this well can be driven and water (if it exists) secured within an hour. In a rocky soil, however, it is absolutely useless. Its depth is about that of the open well and, like it, it is subject to organic impurities through the source. It is easily protected from surface inflow and has some advantages over

The hacienda of Mrs. Hearst, in one of the valleys of the coast range, California. Photograph by G. E. Gould. A. C. Schweinfurth, architect

The kind of outlay best fitted to the dunes and sand stretches of the coast. Grosvenor Atterbury, architect

the open well. The cost of the driven well is but slight, being mostly in the cost of piping and labour. This might be considered roughly as from $10 to $20, outside of the pump.

Authorities seem to differ as to the relative merits of springs and wells; some prefer one, some the other. This point being in dispute, it is safe to assume that their merits are about equal. It is common to consider the "sparkling spring" as the personification of purity. Appearances are deceitful, however. It is fully as open to contamination as any other source of water supply. Rain water in its passage through the lower atmosphere is liable to absorb gases, which are not always eliminated by its passage through the soil. As impurities are very numerous and their effect upon the water varied, the most complete analysis alone will settle the question of its purity.

It is perhaps well to consider the spring as a source of supply for a well, and acting on this basis to excavate and wall up in the manner of a well, to the end of the better protection and preservation. Ordinarily the spring comes to the surface in some depression of the ground, and when left thus in its normal condition cannot fail to suffer from the fouling influences of surface inflow. There are frequently cases where a false stratum of clay may be constructed about it and under the top soil, to protect it from surface water which would otherwise soak into it through the latter.

If a spring is copious enough to overflow after being harnessed to the general supply, measures should be taken to save at least a portion of the surplus for purposes of fire emergency, hose supply and general reserve. This can often be accomplished by collecting it in a suitable reservoir by means of a ram. If an overflow still exists, it can be utilised in various ways as an aquatic feature of the garden or general outlay.

Under ordinary circumstances the ponds and streams are not particularly desirable as supply sources for the private system. This is due to the presence of a considerable amount of undesirable surface drainage from the surrounding watersheds. The washings from barnyards and farms in general are not calculated to add to the standard of purity, while swamps and decomposed animal matter are anything but wholesome. Of the two, the stream is perhaps least desirable, owing to the vast and varied amount of surface drainage it receives. To be of any use as a source of water supply, it should be kept free from dead trees and animal impurities as far as practical. In the case of a small pond situated on a considerable estate, it is sometimes possible to make it an ideal supply system. In this case it is treated in the same manner as the public one.

Wherever the source of supply is lower than the height to which it is desirable to carry it one must resort to a storage system. Its height in any case should exceed that of the highest outlet desired, so that the water may run with some freedom and force. As a protection against fire, where a hose is to be used, this extra height should be considerable (say two or three times the height of the house), as water ejected from the nozzle of a hose depends for its carrying power on the amount of pressure back of it. In other words, it will not rise to near the height if flowing free that it would if confined in a pipe. This will be readily understood when we consider that the fire department of a large city uses an engine to *pump*

The Girard Foster House, at Lenox, Mass. Carrère & Hastings, architects

Inner court of house near Bryn Mawr, Pa. Cost about $25,000. Charles Barton Keen, architect

Cottage at Grindstone Neck, Winter Harbor, Me. An interesting treatment of the summer probiem

Elizabethan house of Allen H. Reed, Esq., at Wayne, Pa. Wm. L. Price, architect

its water to an effective height. It is not desirable to use water from any small storage vessel for drinking purposes, as it becomes stale and often tastes of the vessel; such water is only fit for general household use.

The reservoir, as we understand it in the ordinary use of the term, is a receptacle of some size, usually made with masonry walls reinforced by earth embankments. On account of size and expense of construction it would hardly come within the consideration of this work, but is rather a part of the public system. But, as it sometimes happens that the natural conditions of land and supply make its consideration of some moment, we will speak of it briefly.


Supply tank and lookout at Rowley, Mass. Egyptian motive

The ideal form is that of the oval, with vertical retaining walls, having a slight batter along the shore to 10 feet deep or more. From the base of this wall the bottom slopes gradually to a depth of about 20 feet, at which depth it should be uniformly level. These dimensions might apply to a width of 50 feet; in a smaller affair they could be reduced proportionally. The masonry should be of considerable strength and laid in cement, the bottom being of cement also. It is always better that the reservoir should be built in two compartments, making it possible to draw off the water and cleanse one compartment without interfering with the other. As we have already stated, natural conditions have much to do with their desirability; thus they may be dug into an elevation or level stretch, or enlarged from a natural depression of the land.

The more common form of private storage is the tank system. This may be made in several different ways. The ordinary iron standpipe, the largest and most expensive type, makes an excellent storage. Its natural ugliness may be hidden by enclosing it in a wooden or masonry shell, and with excellent results. This shell should not touch the standpipe; it should be free and independent of it. This, first, to relieve it of wind pressure, and second, that it may be gotten at readily for painting and repairs. This tank, however, is seldom used, as the wooden tank is now made in large sizes, and is both better and cheaper than the iron.

The wooden railroad tank, an immense cask with iron hoops, is used considerably, and is excellent. Built to perform just this sort of work, it is admirably adapted to the country house. Properly roofed in, and its elevating construction enclosed, it is far from being unsightly. These tanks are built to hold from 1,000 to 120,000 gallons, and are preferably of pine or red cypress. For Northern climates, however, it is claimed that cypress, owing to its coarse grain, is very apt to become water soaked. What the frost and cold may do to this under such conditions is readily surmised.

A small and inexpensive storage tank may be constructed by the elevation of several Tarragona wine casks on an enclosed platform. These should be connected, near their bottoms, by short lengths of pipe.

As a precaution in case of fire all storage tanks should be kept full. Their outlet should be slightly raised above the bottom in order that the pipes may not become clogged with possible settlings. Ample ventilation should be afforded them, and they should be protected against the invasion of dirt, insects, birds and small animals. They should be cleansed frequently; this is not the least of important considerations. All storage tanks should have a visible register, which shall show plainly at all times the amount of water they contain.

To give some idea as to the cost of modern tanks and windmills, the following will suggest roughly: An outfit consisting of a 12-foot windmill, a 5,000-gallon tank, piping and tank frost-proofed, windmill slightly above tank, and the whole enclosed with simple wooden house, might cost $500. The 3,000-gallon, plain, frost-proofed tank, elevated to a height of 30 feet, would cost, with wooden tower, about $350.

A comparatively new system of water storage and pressure is that in which compressed air is used to effect the distribution of the supply. A circular tank is placed, generally horizontally, under the ground or vertically in the cellar. This naturally comes between the source of the supply and the distributing branches. The tank, if placed under the ground, is practically level, and of course placed below frost. In this position it supplies water for both summer and winter at about the same temperature as that of the supply. The piping connections are made at the bottom of the tank near its ends; one line leads to the house and the other to the pump at the source of supply. When the tank is located in the cellar it is stood on end as a usual thing, and the inlet and outlet are entered near the bottom.

Door to tank house shown on opposite page

The pump is a special contrivance which can be used for deep and shallow wells, bored or driven wells, and can be used to draw water from a spring or lake. It can be operated by hand or by a windmill or any pumping engine. It is so arranged that water and air are both forced through the supply main into the tank and are prevented from returning by means of a check valve in the pipe. As the water rises in the tank the air is compressed until the former occupies about three-quarters of the total capacity. The compressed air supplies the force necessary for the distribution of water through the house, and water gauges determine the amount of pressure existing.

The tanks are made of wrought steel tested to a pressure of about 150 pounds to the square inch. It is claimed that about 10 pounds pressure will deliver water to the second story under ordinary circumstances, and that an average pressure of 50 pounds can be maintained by pumping a little every day. A pressure of 40 pounds will deliver water to points 85 feet above the tank. It is also claimed from actual test that a 4 x 24-foot tank will deliver through a $2\frac{1}{2}$-inch hose a free column of water 100 feet high. It is important to remember that the tank should be fully large enough to allow for the loss of pressure in the consumption of the water; it is necessary to refill the tank when about one-half the water has been used.

Water tank of the hacienda of Mrs. Hearst

These storage tanks range in capacity from about 150 gallons to 13,500 gallons. The sizes which are used for the ordinary house are those of from 300 to 500 gallons. These tanks alone cost from $75 up, beside the pump and its connections. Thus it will be seen that the system is not cheap, although it is extremely simple. A plant, consisting of a 5 x 20-foot tank, a hot-air engine and piping connections to several houses, etc., in a small settlement has been installed in one instance for about $1,000. Tanks may be doubled up into a battery, forming a storage of considerable size.

Great things are claimed for it, and it seems to have given satisfaction so far as has been heard from. It surely has the advantage of doing away with some of the natural disadvantages of the ordinary elevated tank. However, as it is a "growing" system as yet, whatever its weak points may be, if any, they will without doubt be eliminated in its later perfection.

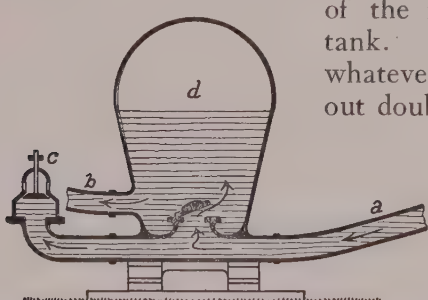


Fig. 44. Section showing the working of an hydraulic ram

a. Inlet b. Outlet c. Weighted valve d. Air chamber

Common rain water, owing to its softness, is frequently used for general purposes. This is stored in cisterns, located either in the cellar or on the attic floor. The cellar cistern is commonly built of brick and cement, and should be absolutely tight, having openings only for pump, water leaders and vent. It should be well protected from the invasion of mice and other animals, as well as insect life. As this form is apt to cause dampness, the attic type should be used, if possible.

To avoid the pump, the attic cistern is used. This should have extensive

horizontal area rather than much depth, owing to the fact that the gutters must be above the height of its extreme capacity. This limit of capacity should be established about 6 inches below the top of the cistern, and an overflow made at that height to avoid any chance damage to ceilings and the like. This overflow can lead to a cellar cistern if desired. It is safer to have the cistern set on a zinc base, which shall project beyond it on all sides and be turned up several inches and connected with a waste pipe. This will save considerable if the cistern should leak. The tank is usually made of 2-inch planking well bolted together. The average rainfall in the Northern states is about 48 inches per year; in the whole country, about 36 per year. Considering that a roof of 1,000 square feet would (in Philadelphia) receive an average of 74 gallons per day, that 8 gallons per capita should be allowed, and that one gallon contains 231 cubic inches, it is easy to get some idea as to the size of the cistern required. If sanitary appliances are to be used, the amount required would be fully twice the ordinary, if not more. It is necessary that the tank be cleaned out every three months or so. This is important.

Water is carried from the source of supply by two methods, gravity and pumping. When the source is higher than the required height to which water is to be brought, the problem is easily solved by gravity. In case the supply source is considerable, the water can be forced to a higher tank by use of the "ram." This simple mechanical device, which operates automatically, enables one to raise a small quantity of water by utilising the force of a large body of water. It takes advantage of the impulse of a flow suddenly checked and directed into the desired channel. Its working is easily explained (see Fig. 44). Water entering the machine through the pipe (a) flows to the limit of the pipe and finds an outlet above the valve (c), which, when not under pressure, falls of its own weight and thus allows the escape. The water continues to flow until its momentum is sufficient to raise the valve (c), thus closing the outlet. The flow, thus checked, rebounds and finds another outlet through the valve in the air chamber (d) until the valve (c) drops owing to a lack of pressure. The same performance is then repeated and becomes continuous. The sudden impulse of water into the said air chamber

Old powder house which was originally a windmill. Somerville, Mass.

A water tower at Roxbury, Mass. Evidently influenced by the Colonial example

compresses the air in the top, and, as the water cannot escape from the chamber by the valve through which it entered, it is forced by the compressed air through the discharge pipe (b), which connects with the storage where desired. Thus we see that the water is delivered from the air chamber in the same manner as when applied to the pump, and also that a large part of the water entering the machine is wasted.

It is necessary for the working of the ram that the drive pipe (a) be from 25 to 50 feet long, and that the fall from the source of supply to the ram be at least 18 inches, so as to obtain the required velocity. If it is desirable to locate the ram nearer than 25 feet to the source, the necessary length of pipe may be gotten by leading a portion of the connection in a coil of about 6 feet in diameter. It is most important that the fall from the supply to the ram should not be too great, otherwise the increased velocity will be such as to strain severely the working parts of the ram.

The relation of source to ram and to the point of delivery determines the proportion between water raised and that wasted. The machine may drive water to a distance of from 1,600 to 3,300 feet and raise it to a height of 100 to 200 feet; often it will do better than this without too much strain on the ram. A fall of 10 feet from source to ram will raise water to 150 feet and even higher, with a diminution of the amount raised. Water carried about 1,000 feet and elevated to a height ten times its fall, will deliver about one-fourteenth the amount of water used, or one-seventh part if the water be raised but five times the fall. Thus in the conveyance of water to a distance of 1,000 feet, where the fall is 10 feet, and the rise is 100 feet, one gallon of every 14 utilised is delivered. These proportions may be used as a basis of reckoning. A small ram will raise about 500 gallons and a large one about 500,000 gallons in twenty-four hours. It is important that the pit which receives the waste overflow from the ram be low enough and properly drained so as to avoid any chance of the contents backing up over the ram. By the use of the ram not only can the water lifted be from the same source as that of power, but it can be from a different source; thus impure water may become the lifting agency for the pure supply.

The most common method of procuring water is by the use of pumps, as the source of supply is more often low than otherwise. One can draw water from a well by means of a "suction pump," but in order that it may be forced into the storage the "force pump" must be used. The common suction pump is good for about 25 feet; for a depth in excess of this the force pump should be used.

Although the hand pump is effective and may answer for primitive methods, yet it is slow and tiresome; this from bitter experiences. A picturesque and effective pump is that operated through the agency of a windmill. There are several types of this machine, which dates its origin back for a considerable period. The cost of windmills varies, as do styles, sizes and the elevation of them. A 10-foot galvanised steel windmill on a 60-foot galvanised steel tower would cost about $275. A 14-foot windmill on a 60-foot wooden frame tower would cost about $375.

Power pumps can be gotten which are worked by several different agents, but perhaps the best of these for ordinary home use are the gasoline and hot-air pumps.

The gasoline affair is a quick and effective worker and reasonably safe; its working will be readily understood by the automobile and motor-boat enthusiast. While this type has the advantage in speed and size, the hot-air is extremely simple, and can be run by anyone with perfect safety. It is possible, too, that one after getting the "hang" of it can fire up and start the thing, close up the house and go fishing, with the reasonable assurance that the tank will be about full when the pump stops. One would hardly care to do this with the gasoline type, and yet both are very satisfactory workers and small consumers of fuel. The cost of a two-horsepower pumping engine is about $285. A hot-air pump of the same power is about the same price.

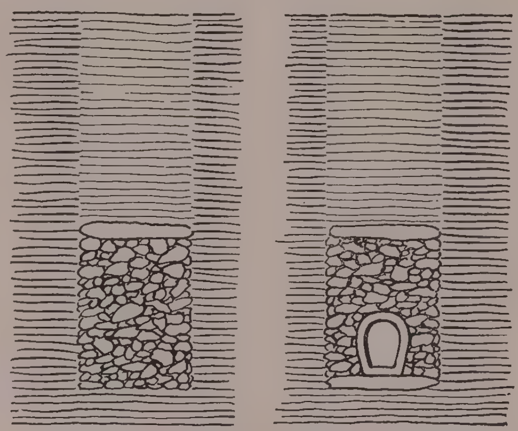


Fig. 45. Blind and combination drains. On the left the blind drain, broken stone affording passage for water. On the right a combination of blind and pipe drains. Both sorts are usable in subsoil and deep drainage

For obvious reasons it is not advisable to "store" drinking water; it should be pumped through a small bored pipe into the house direct. In this way it can be drawn when wanted, and can be had reasonably cool and fresh.

Where the land is over-wet and it becomes necessary to drain it, three systems are employed, viz., surface, under and deep drainage. The system of surface drainage is a primitive one. It consists in making channels through the surface of the ground for the flow of surface water. Though effective, it is unsightly and hardly to be considered in connection with the ordinary country estate. Its disadvantage, where used, is its tendency to fill up, and to disfigure the land, making it an object for constant repairs.

Under drainage consists of a number of small drains placed parallel to one another and opening into a larger discharging drain, which carries the water to the point of disposal. These drains should extend in the direction of the slope of the land, and be numerous enough to dispose of the accumulation. When located under permanent soil they can be laid within several inches of the grade, but in land used for tillage their depth should be sufficient to escape the plough, spade and the like. The drain pipe used is of the porous, open-joint variety, or an ordinary blind drain of small and broken stones may answer if the flow of water is not too great. A combination of the two is even better.

While the surface and under systems take care of the surface water, the existence of excessive moisture, which is commonly caused by hidden springs or other subsoil discharges, makes the use of the deep drain imperative. The source should be located and conditions studied before the drains are dug, otherwise much labour may be wasted. Its principle is that the sources should be intercepted in their passage to the gathering place and carried off out of the way. Frequently the growth of alders, willows and the like indicates the location of the greatest moisture, but this is not to be implicitly relied upon. The drains should be lower than the source of supply, and are ordinarily of the simple blind drain or

composite type (see Fig. 45). It frequently happens that the source of excessive moisture is in a hill of clay, shedding its surface water so as to collect in some hollow. In this case the drain should extend across the shed at its base, thus preventing its surface collection below.

A tank at West Hampton Beach, Long Island, that harmonises with the other buildings. Many tanks are ugly and out of place. This one "belongs." It supplies both house and farm with water. Frank E. Wallis, architect

The dangers attending the ordinary slovenly ways of private sewerage disposal are not to be underestimated. They are frequently responsible for much ill health, and often death. Even the ordinary accepted methods of disposal are bad, they being another exemplification of the old saying, "Out of sight, out of mind."

The great difficulties arising from this question are numerous and very frequently require expert attention, which is often foiled owing to natural insurmountable conditions. We have already spoken of its evil influence on the water supply, but, even provided that that be removed by the introduction of public service, the problem is still complex. Although the importance of public service is early realised, the great evils arising from lack of public disposal do not seem to be appreciated by the public at large. You can get money for new streets and new sidewalks, but the public sewerage system, which is of vastly more importance, arouses no enthusiasm whatever.

The great question in the disposal of sewage is how it may be handled so as not to become a nuisance to someone. It is not only important that the estate to which the sewage belongs shall not suffer ill effects, but that the neighbours shall be in like manner protected from it.

The principal things to be remembered and avoided are stagnation and decay. Waste matter left to itself to collect, and away from the cleansing, oxidising effect of the atmosphere, the purifying action of plant life and the neutralising influence of the top soil, becomes a dangerous nuisance. The chief end to be attained is the destruction of all impure qualities through the agency of natural sources as far as possible.

Liquids and solids should be kept apart as far as may be practical, with a view to the ease of their disposal. The liquids thould be used to irrigate the vegetable garden, lawn, grapevines, fruit trees, etc., or they may be carried through one or more tile drains under the soil to 50 feet or more away from the house and then

allowed to filter through loose stones to the soil. It is important to remember that such applications to the soil should be made before decomposition commences, and in moderate quantities and at intervals so as not to over saturate the soil. Its disposal should be near the surface of the ground so as to benefit by the oxidising influence of the air. Solid matters should be collected and removed at intervals and dug into the soil in the summer.

The old-fashioned privy should not be considered for a moment; where the water closet is not used there should be an earth closet. The earth closet can be procured ready-made, or built as desired. In this the excreta are received into a movable wooden box, well lined with galvanised iron or tarred. Dry earth or ashes are used to absorb foulness, and the box should be arranged so that its removal and transportation be easy. It should be emptied at frequent intervals and the contents disposed of as already suggested. It is understood that a properly ventilated structure should protect it from the rain and weather. The earth closet may be embodied in an extension of the house itself, but it should also be separated from it by an open passageway.

Tank and windmill at Southport, Long Island. A most excellent and dignified treatment. Wilson Eyre, architect

With the use of the water closet the cesspool becomes the natural receptacle. The ordinary method is to release the sewage into the leaching or dry-wall type, in which the liquids, escaping through the loose stones, saturate and permeate the

soil about, leaving the solid matter and grease in the cesspool. It is thus seen that the contents of the cesspool are left to decay slowly, while the soil about becomes stagnant with the considerable liquid impurities. As to the water used in flushing, it is merely a carrying agent and has no material purifying effect.

If the leaching cesspool be used, it is best that it be connected with a blind drain, which may wind in and about such land as is available, at a slight incline, so as to distribute the otherwise concentrated fluid accumulation. The solid matter should be removed at regular intervals and disposed of as already suggested. The cost of an ordinary cesspool is but slightly in excess of the similar well. It is needless to state that every cesspool should be located as far from the house and well as possible.

Hiding an iron standpipe by a wooden shell. A high tower near farm of Thomas W. Lawson, Esq., Egypt, Mass. A standpipe shell like this could be built for about $2,000. Coolidge & Carlton, architects

The good cesspool is the tight type laid up of hard-burned brick and hydraulic cement. It should be built in two compartments, the first receiving the solids and the second the liquids. Each compartment should be circular in shape, domed over at the top and fitted with a manhole having a tight iron cover. It should be ventilated in the best possible manner and be emptied and cleaned frequently. Another type which gives considerable satisfaction is that in which two leaching cesspools with covered tops are used. The first is a septic tank in which the solids decompose. The overflow filters through the dry stone wall to the second tank, where a syphon discharges intermittently, carrying the liquid through tight-laid drain pipes to several filter beds on the surface. These filter beds are of sand about 4 feet deep, with deep drains leading off from under them to carry the purified liquid after its passage through the sand. The filter beds are generally located in clumps of bushes or trees to be out of sight. This system, might, with four filter beds, be constructed for about $400 or $500, and although it is contrary to the principle of not allowing any matter to decompose, yet it is said to give satisfaction. It is argued that the solids become dissolved and largely assimilated by the liquid matter.

One thing to be borne in mind with all types of cesspools is that they should be

of moderate size, so as not to accumulate too much matter, thus tempting less frequent cleaning. The cleaning of the cesspool is necessary to its perfection.

All connections between the house and cesspool should have the proper disconnecting traps to avert the possibility of sewer gas entering the former. It may be advantageous to use a slightly impure water source as a flushing agent. Sometimes water may be struck which, though unhealthy if taken into the system, can well be utilised for this purpose.

Though there are times when the home sewage can be disposed of through the medium of quick water, it is apt sooner or later to cause trouble. We have already stated that water is but a carrying agent, and as such it is more than likely to carry sewage where it is not wanted. Tidewater streams are out of the question, and direct transmission into the ocean tends to defile the shores to a greater or less extent. There are cases, of course, where both the quick stream and the ocean may be utilised, but such are rare.

A windmill that is not unsightly. Everyone who can afford to cover the steel frame of a tank with a wooden shell should do so out of respect for neighbours, visitors, and the landscape

One of the best methods of private sewage disposal is by means of the subsoil irrigation. This system is superior to the broad (surface) irrigation in that it is neither offensive to sight nor smell. It is based upon the fact that soil next to the surface of the ground possesses in a large degree power to destroy organic matter buried in it. Therefore the distribution of waste should not be greater than 10 or 12 inches below the surface.

An intermittent discharge of sewage affords the upper soil time to take up oxygen during the interval and to breathe preparatory to the next discharge. The frequency of discharge depends on the amount of waste to be disposed of, the size of tank and area of piping. It should not however occur oftener than once a day.

In brief, this system consists of an absolutely tight tank for the collection of household wastes and a network of common drain tiles laid with open joints below the surface through which the accumulation is discharged. The irrigated field may well be under the grass plots and flower beds, that the growth may take nourishment from the distribution. The soil, of course, should be porous, clay and damp soil being well under-drained. Generally the small drain pipes are laid in earthenware gutters laid with open joints, and having earthenware cups to protect them from the soil above. The ordinary pitch of 3 inches to 100 feet is usually sufficient.

The main discharging drains, which lead from the tank to the lesser distributing drains, are ordinarily 4-inch, laid with cement joints and connected by Y or T branches. Starting from the tank at a depth of 2 feet, they gradually reach the depth of and connect with the lesser distributing drains. With this arrangement it will be seen that the field of irrigation is somewhat removed from immediate contact with the house.

The above system, as described by Colonel Waring, is on the following lines: A double-chambered flush tank is located at some distance from the house and discharges intermittently through the main pipe, which is laid with cement joints and has a pitch of about 4 inches to 100 feet. This pitch, with the natural falling off of the land, will bring the pipe to the sub-surface under ordinary conditions. The connections with the tile lines are made from the bottom of this pipe. There should be a gate on each branch of the distribution, so that they may be used in rotation to receive the discharge (see Fig. 46). He suggests that the lesser distributing pipes be 4-inch horseshoe tiles, laid in trenches of small broken stone or pebbles. These should be pitched 2 inches to 100 feet so as to avoid an accumulation of matter at the end of the drains.

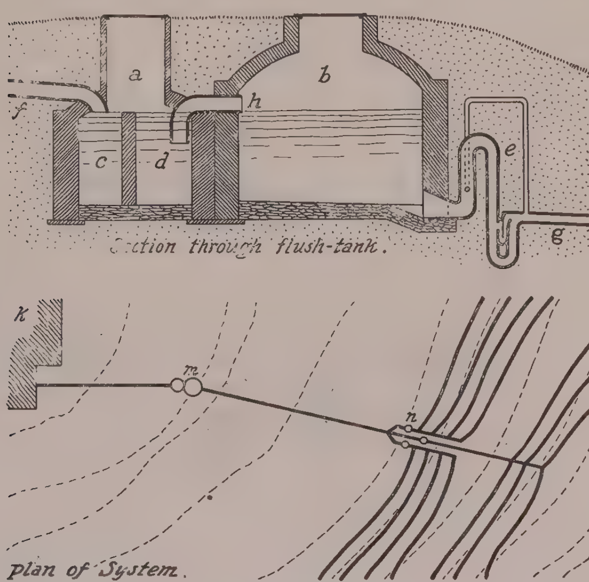


Fig. 46. Showing the flush tank for the sub-soil system, with plan of pipe outlay

a. Settling chamber
b. Discharging chamber
c. Receiving compartment
d. Overflow compartment
e. Siphon
f. Inlet
g. Outlet
h. Overflow
k. House
m. Flush tank
n. Distributing outlets

The double-chambered flush tank (see Fig. 46) consists of two circular masonry tanks with solid walls, the first and smaller chamber of which holds back the solids and scum, while the second chamber accumulates the liquids ready for discharge. The discharging chamber should be made large enough to hold the product of at least twelve hours; it may be enlarged for a twenty-four-hour deposit, but no larger. The house drain or inlet (f), discharges into the receiving compartment (c) of the settling chamber (a). The discharge being more or less agitated, it is necessary to make two compartments of the settling chamber so that the overflow (h) may not carry solids into the discharging chamber (b). The overflow compartment (d), being separated from the receiving compartment, is not disturbed by the inflow, and is thus effective. When the discharging chamber becomes full the syphon discharges automatically the entire contents. Manholes are made in the top of each chamber so that it can be readily gotten at and cleansed.

The chief objection to this sort of flush tank lies in the fact that the receiving compartment has all the worse characteristics of a cesspool. For this reason the tank should be located at some distance from the house and be cleaned of

solid deposits frequently. The only objection that has been raised against this system as a whole is that the pipes sometimes become clogged and have to be dug up. In such cases it would seem that the trouble is not with the system but with the manner in which the pipes have been worked; they require proper flushing to keep them clean.

Whatever method of drainage or sewage disposal is adopted, it is important that it be decided upon before the inside house drainage system is arranged, otherwise complications are apt to arise.

The sanitary principles which govern the disposal of the house sewage may well, with certain natural limitations, be applied to that of the barn and stable. As in the former case, the separation of the liquids and solid matter will add materially to the ease of its care and disposition.

Although garbage cannot be considered as either drainage or sewage, its disposal is an important sanitary consideration not to be treated lightly. Provided poultry or swine form a part of the stock, this question is simplified, especially in the case of the latter. Poultry, however, are fastidious and are apt to leave much to be trod under foot and decay, which makes it necessary to collect and compost this rejected element. Where neither poultry, swine nor the public collection are at hand to aid, the composting of garbage becomes a necessity.

Whatever method of disposal is used, the garbage receptacle itself should be of galvanised iron with a tight cover. This receptacle should be frequently emptied, and as frequently and thoroughly cleaned. It should not be kept indoors under any consideration. Sometimes the natural conditions are such that it may be enclosed in a tight box with a cover, which box may have a small galvanised vent pipe running into the kitchen chimney and thence to the top and the outside air. Such an arrangement, if feasible, will carry off any odours which may collect.

Windmill and tank combined to make a tower for the barn

A modern Colonial stable at Brookline, Mass.

CHAPTER XIV

Outbuildings, Gateways, Etc.

OF THE several buildings of lesser magnitude than the house which go to make up the complete system of the country estate, the stable is perhaps the most important.

To the man who has made the horse a study and interested himself enough to have a stable of his own, the certain requisites are more or less familiar, and perhaps better understood than the convenient planning of the house. The horse lover knows his charge and the relative locations of the working parts.

To begin with, let us take the horse from the stable: First he is led from the stall, allowed to drink, then is brushed up and receives his harness, after which he takes up the carriage on the route to the out of doors. Thus a light and convenient place for such cleaning should be provided; the harness room should be handy to this, and between it and the carriage or coach house. It is essential that everything should move outwardly, in the most natural and convenient manner. The desired carriage should be easily pulled into free space and the whole turnout ready to pass through the door without effecting any fancy figures or trying to stand on its head.

On returning, the carriage is dropped in the carriage house, to be rolled later to the carriage wash. Horse and harness pass on to a cleaning space, which shall be used for that purpose alone, where the harness is removed and carried to

the harness room close at hand. The horse, carriage and harness are cleaned and returned to their proper places, with very little trouble and fuss.

It is a good plan to have entrance doors on opposite sides of the carriage house, so that the turnout may be left to stand for a short time under cover in cold weather, and that it may be driven out of the opposite door from which it entered, saving the annoyance of backing out. The above arrangement is shown in Fig. 47, and is easily followed from this description. It is simply necessary to call the attention to the main lines of traffic and the ease with which they connect the various parts of the outlay. The doors a and b would naturally be used as exit doors, while the door c would be used as an entrance. In this last case the carriage is left on the wash stand and the horses unharnessed there. The staircase to the hayloft is in the southeast corner; the other staircase leads to the quarters of the groom.

The carriage house should be planned to allow from 2 to 3 feet

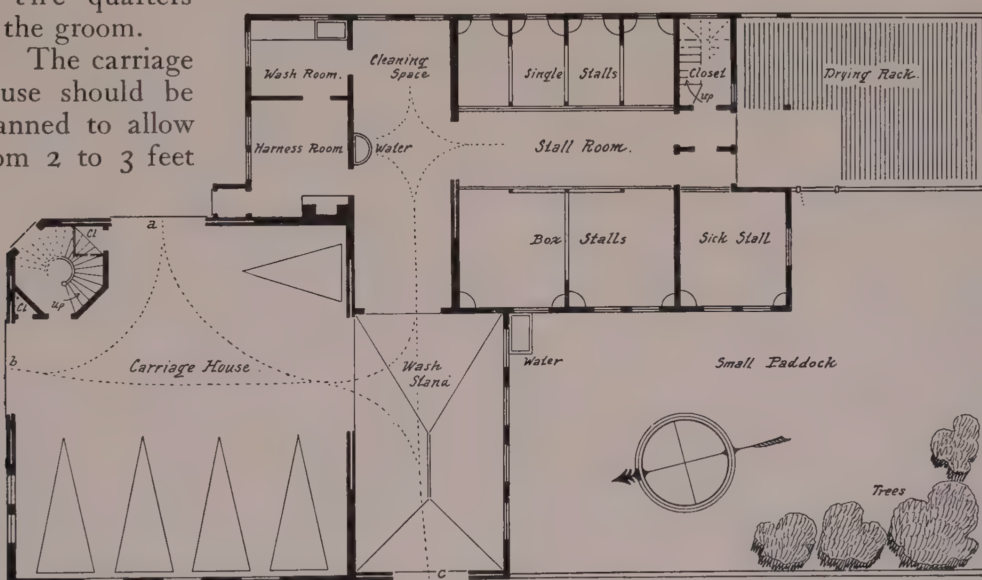


Fig. 47. Plan of stable to illustrate the principles advanced in the text

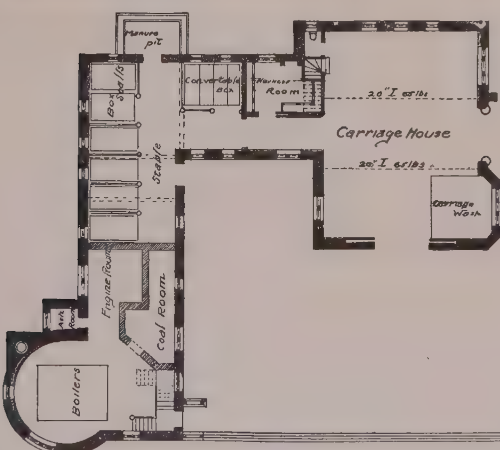
between the hubs of vehicles, and also that they be drawn into free space and headed for the entrance with the least possible trouble. In allowing for free space, not only the carriage but the horse must be considered, as the latter must often pass the former in order to reach the thills. Its height, as well as that of the outside doorway, should be about 14 feet, so that both carriage top and the driver's head be spared the possibility of collision. Blinds should be provided, so that vehicles may be protected from the direct rays of the sun, but the room should be free from damp and moisture. A closet for the storage of lifting jack, wrenches, wheel grease, dusters and spare carriage covers will be found of much convenience. Hardwood poles, 4 inches in diameter and of smooth finish, should be provided for the hanging of robes.

The carriage wash should be handy and yet removed from the carriage house in such a manner that its general dampness shall not affect the latter, or,

for that matter, any other part of the stable. Frequently the wash is without covering, but this does not seem to be the best treatment. It may be made with open sides and roofed over after the manner of a porch, but even this has its disadvantages in cold weather. It should be well lighted and ventilated, and the floor made of asphalt, sloping toward a central drain. Sponge and chamois racks should be provided.

The walls of the harness room should be sheathed and the room provided with either fireplace or stove for use in damp weather. Harness cases should be used only for storage; harnesses in use should be hung on wooden brackets, viz., reins, bridle, saddle and collar brackets. Besides these the saddle tree and whip rack will be found necessary. All these fittings may be had of the saddler.

Although harnesses are usually cleaned in the harness room, it is better on account of dampness that a separate and well-lighted and ventilated room be provided for this purpose. This is best located between the harness room and the wash stand used for horses, as the horse led at once to the latter can be easily relieved of his trappings, which then move by the shortest route through the process of cleaning to their final disposition in the harness room. The cleaning room should be fitted with wash sinks, suspended harness hooks, harness pegs, shelves, wringers, sponges and chamois racks.



Stable at Overbrook, Pa. Cost about $12,000. Wm. L. Price, architect

The ordinary stall should be about 9 x 5½ feet, with vertical sheathed side partitions about 4½ feet high, surmounted by an iron screen 2 feet high. This screen is best constructed of perpendicular bars.

The box stall should be about 10 x 12 feet, provided with doors sliding laterally or swinging outward. The box stall reserved as a sick stall should be about 12 x 16 feet, and so arranged as to be entirely shut off from the other stalls.

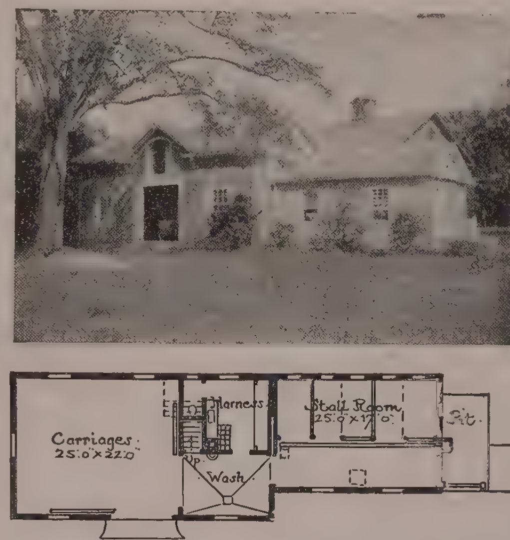
It is probably unnecessary to state that the place for the manger is in the left and that of the hayrack in the right hand corner, but for him who would tie up a horse by the tail this would be information. The quarter-round metal manger seems to be the accepted type; it is simple, clean and convenient. It is

now acknowledged that a horse naturally eats off the floor, or at least not higher than his own chest. For this reason the hayrack as well as the manger are best placed in the latter position. There is of necessity much scattering of food in a horse stall, but it seems as if the feeding of hay and grain through chutes from above reduces in a measure the waste, as well as the danger, attending the use of a metal-tined fork.

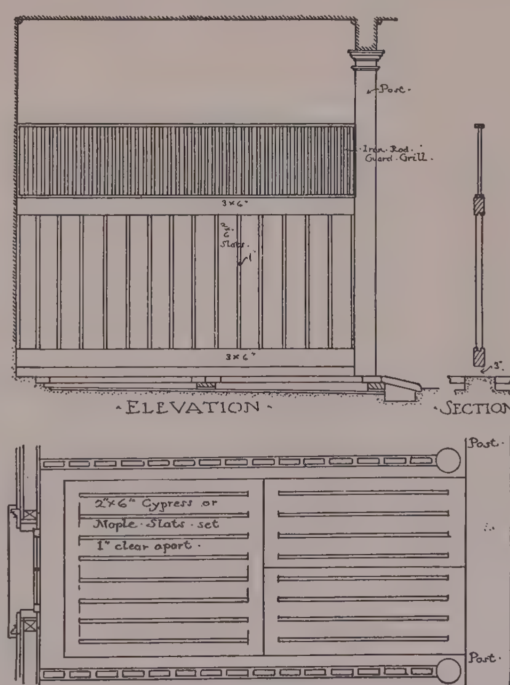
The flooring of a stall is a vital question. For the sake of cleanliness and durability it is usually of brick; for the comfort of the horse, of elm or oak. Being in any event a hard surface, the custom of using the branch drain in the centre of the stall and pitching the flooring toward it from either side, should be adopted with limitations. The pitch is apt to twist the horse's feet unless it be very slight. This centre metal drain leads to a main drain, also of metal, running in the rear of the stalls. The box stall offers a relief to the horse, as its floor can be more readily covered with tanbark or the like without danger of much scattering.

Stall windows should be about 9 feet from the floor. If it is deemed advisable to make a window low enough for the horse to look out of, it should be but supplementary, and capable of being closed in windy or cold weather. All windows should, however situated, be provided with screens.

As a relief from standing in the stall, the paddock is excellent. It should be placed on the south side, and be partially shaded by trees if possible. In size it may be from 30 to 75 feet square, as circumstances allow; the larger size is of course to be preferred. A 6- or 7-foot fence should enclose it; a lower one may suggest to the horse that he can jump it, which burst of overconfidence may result most disastrously to either the horse or the fence, or both.



Stable at Dedham, Mass. Cost abont $2,300. Capacity, five horses and four carriages. The part of the building to be heated is in the centre, shut off by heavy doors from stalls and carriage room. Frank Chouteau Brown, architect



Section and plan of horse stall of above example, showing an excellent method of floor construction

The drying platform, intended for the drying of bedding, should be located on the south side, be open to light and air, and at the same time be handy to the stall room. It is constructed of plank slats, about 4 inches wide, spaced about $1\frac{1}{4}$ inches apart, which allows a free circulation of air through the bedding.

Stall room of stable at Newburgh, N. Y., showing box and ordinary stalls

With the possible exception of a certain place of which we have heard much, and which is reputed to embody the major part of the great hereafter, the ordinary hayloft in summer is the hottest spot existing. For this reason it should be as well ventilated as possible. The hay should be handy to the chutes and may occupy part of the space above the stall room. Grain chutes should be of tin or tin lined, and the latter treatment should be applied to the hay chutes. It is important that all chutes be provided with metal-lined, hinged covers. Dust is thus shut off from the stall room, and the risk attending the open flue in case of fire in a large measure obviated.

If one is obliged to depend on that probable ancestor of the modern cereal, called "baled hay," a hay pole should be provided for. It is essential that it be placed high enough from the hayloft floor to allow of a free working of the hoisting tackle. Even if the tackle works free of interference of the blocks, their nearness hinders the swing necessary to the easy entering of the aforesaid "cereal" through the loft door.

Barn and poultry house at Chestnut Hill, Mass.

If one has the necessary funds to expend on the stable, let him construct a rat-proof grain room. It should be located over the stall room, and in any event be fitted with tin-lined bins.

Sometimes these bins are so arranged as to connect from above directly with the chutes, but, as the better method requires the presence of some one in the hay-loft at meal times, this is not necessary.

The ordinary manure pit is the receptacle for more moisture than is absolutely good for it. A certain amount is requisite for the betterment of the manure, but if the bottom of the pit be drained the surplus moisture is easily disposed of. If it may receive some light and good ventilation it will be the better for it.

Heat for the stable should be limited to the carriage house, harness room and grooms' quarters. In the carriage house it should be so placed that the radiators shall not come in close contact with the carriages.

Stable on the D. C. Blair estate, at Bar Harbor, Me. Living quarters above. Could be built for about $12,000. Andrews, Jaques & Rantoul, architects

Heat, if carried to the stall room, should not exceed the freezing point by many degrees. The horse, unlike man, is often obliged to remove his overcoat when going out, and in any event the change from a highly heated stable to the outer cold is a dangerous transition. There are those who claim that no heat at all is best, but it would seem better policy to install a system of indirect heat capable of raising the lowest outside temperature to 35° F. This, if properly installed, could be reduced as much as desired by tempering with the cold-air supply.

It is natural that all animals and fowls should require a certain amount of fresh air, and this may be unlimited up to the point of draught. With the temperature of fresh air at 32° F. or below, the supply for one horse per hour may be limited to from 4,000 to 6,000 cubic feet; this calculation should be made outside of leakage.

Cold water should be run to the stall room, wash room, cleaning rooms and grooms' quarters; hot water to the cleaning rooms and wash room. In this latter case the faucet should be of the plain unthreaded type, to which a hose cannot be attached; the reason for this is obvious. What little hot water is required for the stall room may be gotten from the adjacent cleaning room.

The consideration of the barn is for the benefit of the few who may desire to play the farmer. The ordinary country affair of tender memory has stamped its influence upon its descendant much too thoroughly to be mistaken; the wide central alley, side bays and scaffold are not to be denied. The ordinary barn for the

country estate would probably provide for horses and cows, including colt and calf pens and perhaps a bull pen, granary, hay and straw mows, and a milk room separated from the rest of the barn in such a way that it may be secure from infectious odours. This last is important inasmuch as milk becomes tainted very quickly, and its removal to an isolated place at the earliest possible moment is imperative. To the above list should also be added the enclosure or paddock for both horses and cattle.

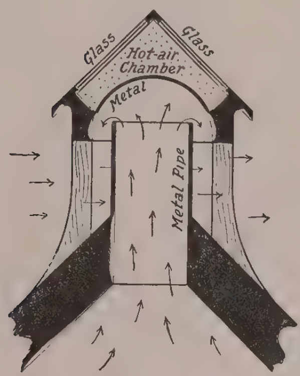


Fig. 48. A good stable or barn vent

We have already offered several suggestions for the horse stall; there remains the cow stall. It is doubtful if the common type of tie-up can be much improved upon, at least by any radical change. Every cow comes instinctively to the old-fashioned contrivance, and with a clever toss of the head at once fastens herself in the self-locking yoke. The contrivance is very simple and complete, and it is hard to see just where any radical improvement is warranted or desired.

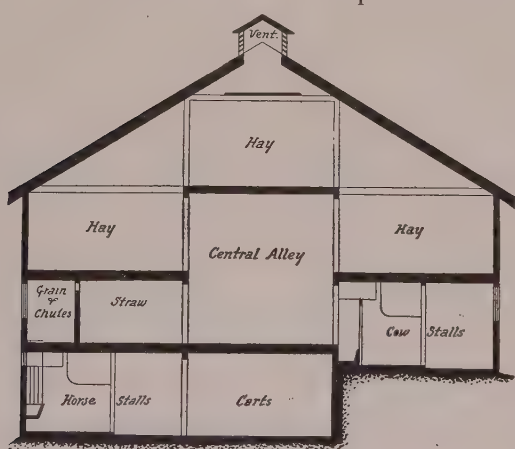


Fig. 49. Section through a barn

Cow stalls are built in two styles—single and double. The single stall is usually about 5 x 9 feet and the double about 8 feet wide. It is needless to state that the single type is preferable.

The cow is fed off the floor level, the manger being placed upon it, and the feed is delivered at the front and from the central alley on which the stalls usually face.

The bull pen may be 8 x 16 feet, with tight wall, and is usually more or less dark. It has direct access to the cow yard. As the bull is often hard enough to lead in a straight line, to say nothing of fancy curves, etc., it is best that his pen be provided with an entrance at either end, each leading to the yard; in this way he may travel always forward, and his possible escape be limited to the aforesaid cow yard.

The amount of air allowed for cattle is the same as that for a horse. As there is no heat, the ventilation is by natural draught. This, however, may be accelerated under normal conditions by making the top of the roof vent of glass; the sun will thus warm the air at the outlet and create a draught.

A good type is shown in Fig. 48. The metal vent pipe is carried into the dome so that the flow of air shall not be cut off by strong winds blowing through the hood. The hot-air chamber accelerates the draught.

A simple and convenient type of barn is shown by the section in Fig. 49. The site is on sloping ground, and the central alley extends through from end to end, with double doors and a driveway at each. This alley is 2 feet above the level

of the cow stalls, and from it the feed is delivered. Hay, straw and grain are handy to it and also to the horse stalls on the lower slope. The cow yard and horse paddock are located conveniently adjacent to their respective stall rooms.

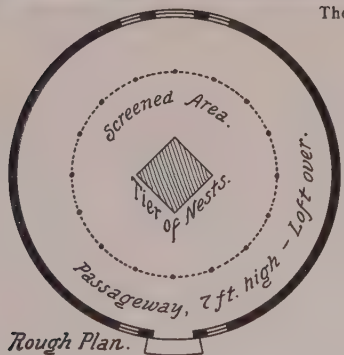
Two views of barn at "Fairacres," Jenkintown, Pa. A highly interesting example of simple, artistic treatment. Wilson Eyre, architect

Poultry houses are usually any old shed, and with such an ancestry it is hardly to be wondered at that the more elaborate affair is not more carefully considered. The fancier who naturally takes a special interest in his stock is keenly alive to the inefficiency of the primitive methods and advances accordingly.

Poultry being, in our cold climate, out of its natural sphere, is dependent on us for an equalising of conditions. Thus heat is required in winter, reasonably cool quarters in summer, and light and air at all times. Wet and dampness, too, should be avoided, even with ducks and geese, for while these may require a shallow wallowing pool,

they do not roost but squat on the ground. Turkeys especially are delicate and require great care, and dampness is fatal to them. The invasion of rats and small preying animals should likewise be considered, as the trouble and annoyance from such sources is commonly known.

The Thomas W. Lawson dovecote, at Egypt, Mass.
Coolidge & Carlson, architects



With the above consideration in view, it is well that the entire poultry enclosure, including house and runs, should have a brick or stone foundation, laid in mortar, which shall comprise the vertical sides of an excavation some 2 feet deep. The bottom of this excavation should be composed of small stones with a top layer of concrete, the whole to have a slight pitch to shed moisture. At intervals in the wall at the lower side of pitch should be placed blind drains of very small stones or pebbles, so that, while the water is allowed to run off, no rodent may work his way through them. The excavation to the runs may be filled with gravel and loam, but that of the house should have clean gravel with a considerable top layer of clean ashes.

Roosts for hens, etc., should not be too high, and are best provided with a wooden platform below them. They should be round, amply large, and not too smooth. Turkeys roost perhaps higher than hens.

Nests for hens and turkeys may be fairly low, yet off the ground; those of ducks and geese practically on it. All should be secluded and yet easy of detection by the poultry. The hatching house should be separated from the main body of the house to insure quiet.

Heat can be furnished in sufficient quantities through the medium of a stove placed in the feed room, and the feed room should be centrally located so as to convey this heat to roosting house, hatching house and scratching pens, without too much complicated mechanism. Naturally the house should face the south, and a steep glass roof extending to the ground will add much to the general comfort of the occupants in winter time.

It has been decided that the "run" should be long and narrow, rather than nearer the square form, the poultry getting as much exercise with a smaller area outlay. As it may not always be desirable to roof with wire, the top of the run fence should not be a stick of timber; it is too easily located by the fowl that may desire to "fly the coop." One width of coarse-meshed wire stretched from uprights of some not too prominent colour is more effective and less discernible to the poultry. In the case of chicks, it is very desirable that the lower

The most approved and serviceable form of poultry house

portion of the fence be of fairly small-meshed wire, for evident reasons.

A simple and convenient hen house is shown in Fig. 50. It may be subject to modification or elaboration if desired, but it has much that is good as it stands. There is ample glass in the winter pen for the low sun of the cold season, and in summer sections of the steep pitch may be replaced by blinds with fixed louvers. The nests are secluded under the roost platform and easily gotten at from the back passage, which last, being to the north, affords additional protection from cold by reason of its air place. The feed room is enclosed with a brick wall and contains, besides the heater, two grain bins and a water tap; it could readily be larger and more elaborate. From its location, it will be seen that registers in the top of the sides would carry heat where it is required. Hatching pens are separated from direct contact with the main house and yet convenient to it. All nest compartments have been

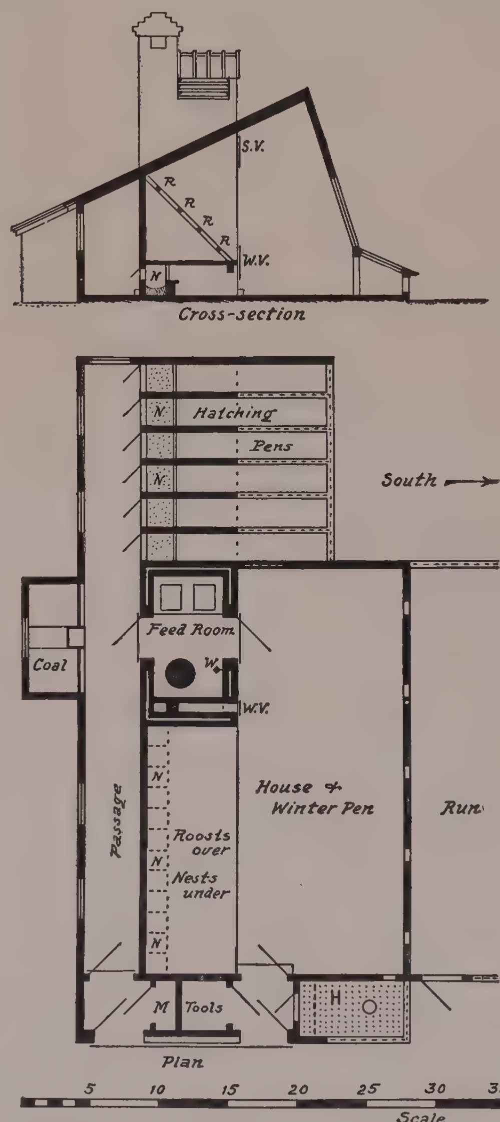
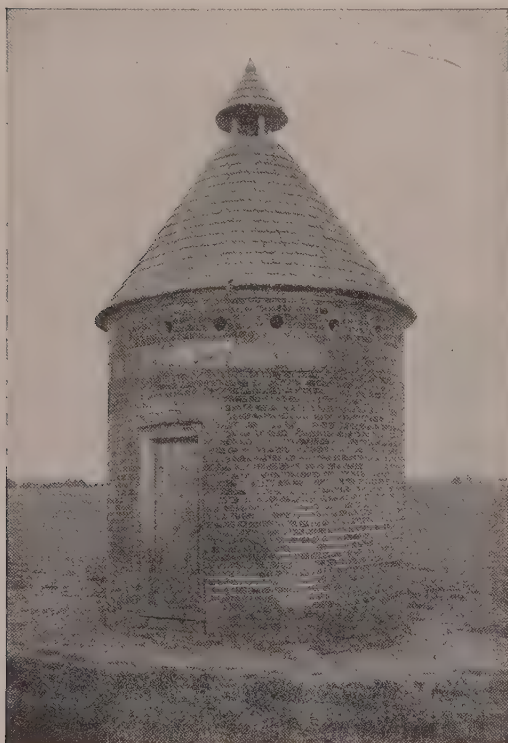


Fig. 50. A poultry house for limited stock

H. House of correction
M. Medicine closet
N. Nests
R. Roosts
S. V. Summer vent
W. Water
W. V. Winter vent

arranged so that a bed of ashes may be placed under the straw nests. The "house of correction," so called, is located in the most prominent and exposed corner so that its nest-struck occupants may not be lonesome. It is provided with a roost in the sheltered corner, and a drinking jar, as indicated. The floor is of boards filled with small wire spikes driven in at intervals of 3 inches apart and projecting 2 inches above the boards. It is at once evident that such a field of trouble, while it cannot harm the prisoners, is at once the most uncomfortable affair to squat on and at the same time, from the spacing of nails, easy of navigation. It may be added, for the benefit of those whose apprehension may be roused, that the head of a wire nail is round and smooth, and, of the size suggested, perfectly harmless to the fowl. Wooden pegs may be substituted.



Old dove-cote at "Shirley," James River, Va.

The pole house for pigeons, while not so common in this country as in England, is nevertheless a decorative feature of some merit. It should have a stout pole support and may be reached by a ladder. Its natural construction and location remove it beyond the reach of cats and other animals. It should be located in a sunny spot, protected from the wind, and should have an overhanging roof to exclude the weather. The pigeonholes, wherever they may be used, should be 4 inches wide by 6 inches high, and should face a warm and sheltered quarter. Naturally, each hole has its projecting shelf.

The old-fashioned dove-cote has, thanks to the survival of the fittest, found a new lease of life, and as now used is frequently built with a flying cage attached. The flooring should be of brick, stone or cement as a safeguard against rodents. The nests must naturally line the walls, and its plan may embody practically two stories, as in the Lawson example. If pigeons are allowed to fly, some device should be used to shut them in if it be desirable.

The most common form of pigeon house is that which forms a part and a feature of the stable or barn gable. Ordinarily this consists of one large apartment in which an unholy war is forever raging, resulting in broken eggs and dead squabs, besides the general spirit of conflict. Each bird, male or female, should have a separate room. These may be connected pairs with separate entrance holes (see Fig. 51) and a common lobby or porch. In this way more peace is had, as well as an increase of squabs. A wooden bowl in the corner of each, filled with hayseed, will serve as a nest, and in this way it is claimed that two broods

are brought up at the same time, one by each bird. The best size for each nest should be 10 to 12 inches square. It might be increased slightly in length, say 2 inches.

Pigeons require plenty of water, and, if confined, should be provided with an earthen poultry fountain in preference to the open receptacle of much splash, feathers and general filth. If each tier of nests be projected one beyond the other, there is better protection from the weather and less liability of a front-door "scrap" than if they be placed in on a single vertical plane (see Fig. 51). The lobby idea, already referred to, will be found to save the scattering of filth to a large extent, whereas the usual projecting and individual shelf invites it.

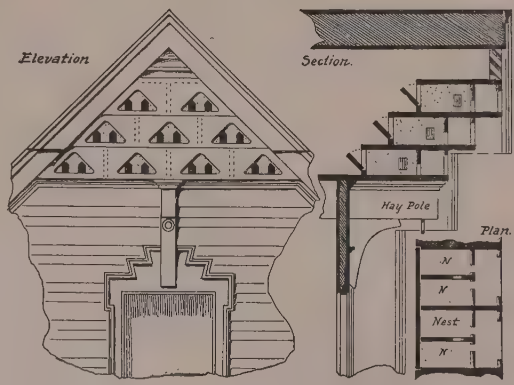


Fig. 51. Small pigeon house for gable end of stable. This motive rests upon and extends beyond the hay pole

The automobile house is little more than a single room for the accommodation of the machine, with perhaps a closet or two. It is best that the closets should be removed from the main room and the whole building from foundation to roof be made absolutely fireproof. It should be well lighted. If gasoline be used for fuel, the tank should be isolated and on the line of the drive. In no case should it be in connection with any other building.

Where one is compelled to rely upon a private supply of ice he must provide for its storage. The ice houses of the Penobscot River, Maine, are built with hollow walls filled with sawdust and ventilated at the top. The private affair may be made in like manner. Its ventilation may be at the gable peaks and under the eaves; these vents should be screened, not for fear of mosquitoes, but to exclude birds, rats, etc. Sometimes the ice house may be partially dug into a bank, but at all events it should have a bottom composed of small, loose stones perhaps a foot thick, with a blind drain leading from it to carry off the water from the melting ice. The doors should extend from bottom to top in sections, that the easy storage of ice may be accomplished. It is needless to state that the natural shelter of trees should be sought in every case, as aiding materially to retard the melting of ice. Ice is ordinarily packed in sawdust and sometimes in straw; it should be thoroughly done; of the two agents the sawdust is perhaps to be preferred.

Pigeon house in stable at Southport, Conn.

A clean, rich, free treatment in the Colonial style, suggestive of ample estates beyond. Cost about $900

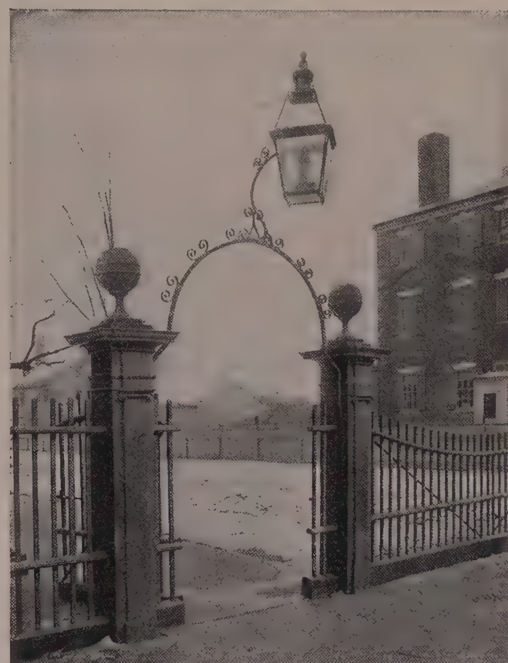
Stable at Woodmere, L. I. Cost, $4,500. On the second floor there are four rooms and bath

The ideal treatment of the barn and courtyard problem. Roos & Booraem, architects

Boathouses were not originally designed to play billiards in, although the billiard room, den or gymnasium may be, each or collectively, a part of the entertaining feature of the building. That there should be a guest room of some sort goes without saying, and naturally the style and decoration should be of the most informal and comfortable sort. It may or not have heat, although its installation would never be regretted.

When one thinks of the boathouse the balcony idea is naturally associated. That it may be made a feature of great comfort and utility, as well as a decorative possibility, is not to be disputed.

The boathouse from the standpoint of its uses demands dressing rooms, toilet and bathroom, to make it complete as well as to add to the general comfort and utility.



Old Colonial gates at Salem, Mass. A good example of wood design, in which the sweep of the carriage gates is continued in the smaller gate. The iron work, however, sits rather awkwardly upon the posts. Cost about $75.

The ordinary boat landing is the "float," reached by a gangway. Rowboats are ordinarily moored to the float or pulled upon it if desired, while sailboats, motor boats or other large craft are anchored clear. Floats may be secured in still water which is naturally free from tides by anchoring or by the use of piles. A convenient method of anchoring a small float is to make the outer anchors of two strong wooden boxes, iron or wire bound. The wire guy is fastened through two holes bored in the middle of one of the long sides. This box, when filled with stones and sunk, will be found to be a fairly secure anchor. The problem of getting this heavy weight out into deep water is at first sight a considerable undertaking; it is, however, comparatively easy. Take fairly strong rope and attach it to each corner of the box securely, and bring the four pieces together above the box and fasten so that the box may be hung from this support. Put this overboard from the stern of a boat and allow enough supporting rope to keep the top of the box under water, a position which it will readily reach if a few stones are put into it. Having provided the top of the box with a partial cover around the four sides, allowing an opening in the centre large enough to put the stones through, fill the box from the supply of stones in the boat. As the weight of stones is considerably less under water than it is if exposed, a considerable anchor may be made in this way. When filled the box may be rowed to any point desired, the guy straightened and pulled taut, and the anchor placed by cutting the rope. It is also possible to construct a boat anchorage in the aforesaid manner.

In quick water and tides the pile is the best retainer for the float. The float

rises and falls with the water, and is held in place by two or more piles. This use of the float is the common method, which has the disadvantage of having to be entirely unshipped and removed at the end of the season and put down at the beginning of the next. This is no mammoth undertaking, and yet any saving method that works as well is better.

There are cases where the cutting out of a portion of the bank or shore or the straddling of the house across a creek or inlet gives one a chance to keep the lighter boats below the house, which is a good arrangement. It also has the advantage of taking up less room in the water, which may be of considerable moment in the consideration of a small stream. Fig. 52 shows such an arrangement, designed to harbour a small launch and a rowboat. The gangway, hinged to the rear platform, rises and falls with the water, and in winter is drawn up by means of a tackle and secured to the crossbeam of the floor above. The gates which close the two openings make the boats more secure from the fancies of the light-fingered public, as well as serving to break the force of any rough water outside. This plan shows also a small swimming pool connected with the boathouse, but each is so entirely complete in itself that they could be separated with the need of but little change in the planning of each.

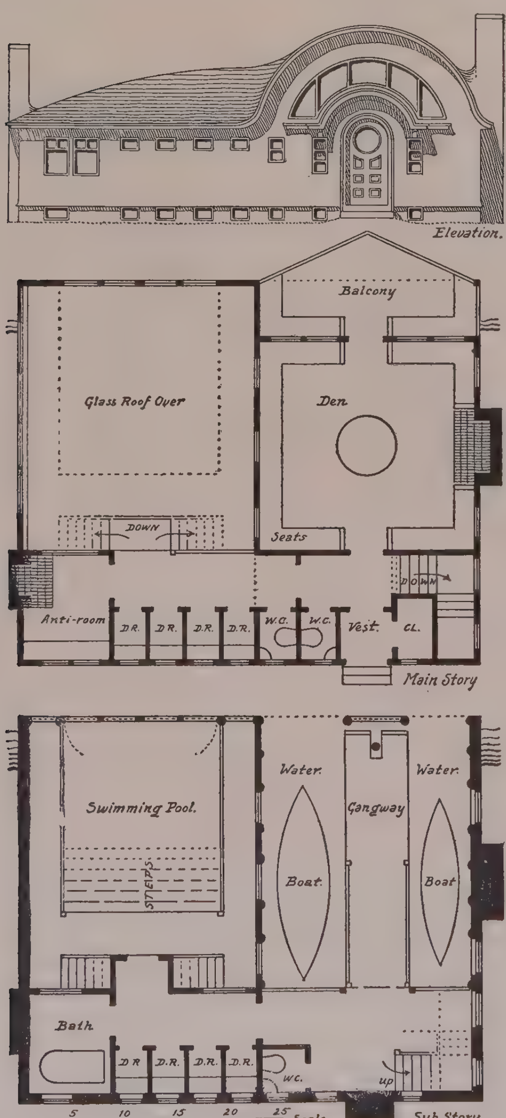


Fig. 52. Sketch for a combined boat and bath house. The latter could be omitted without hurt to the former

Wherever the natural conditions warrant the bath house, it may be considered in two ways: First as a free and independent structure; or, second, it may be so planned as to form a shelter and covering for the swimming pool. In this latter case the sides and top should be of glass, that the otherwise cold water and atmosphere may be tempered (see Fig. 52). Some of the Northern localities demand this. The bath house may be simple or elaborate, but it should contain dressing rooms at least, with adjacent corridor; it is best that the dressing rooms do not open directly outdoors. The more elaborate structure may contain heat, bathroom,

A dignified treatment of the entrance wall. The poplar-flanked avenue strongly suggests a French or Italian villa

toilet, lounging room and sun parlour, all of which are natural adjuncts under certain conditions. The bath house can then be made a thing of some comfort and attraction.

Although the near presence of pond or stream often offers excellent bathing, there are times when natural conditions make the home swimming pool possible and advisable, from the standpoint of privacy. As is usual with our Northern climate, the untempered conditions of the water are such as to make outdoor bathing a sort of daredevil feat rather than a pleasure. The artificial pool, then, solves the problem, inasmuch as through it the temperature of the water can be largely controlled. If situated on the coast or on tidewater, your pool can be an offshoot from the source of water supply (see Fig. 52) or separate, as desired. In either case the pool may be filled at flood tide and retained and warmed by the sun; in this it is necessary to utilise an enclosing wall to cut off the wind. Whether or no this wall be roofed with glass is a question depending entirely on existing conditions.

Boathouse at Southport, Long Island, used for the winter housing of a launch

If one happens to have a clear brook crossing the estate, he is most fortunate. The pool can be made directly a part of the watercourse by damming, but the objection to this is that running water of this sort is very likely to be spring fed and thus cold, and that the current may be more or less objectionable. It is better that the pool in this case be partially or wholly removed from the course of the brook; the water is easier warmed in this way.

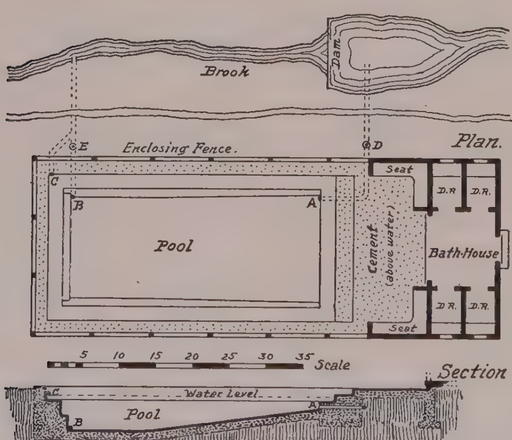


Fig. 53. Plan and section of a swimming pool fed from a brook or stream. Might cost from $600 to $900

One method of constructing the isolated and brook-fed pool is illustrated in Fig. 53. The pool may be located near or at some distance from the watercourse, and may be slightly higher or on a level, as conditions will allow; the low problem obviates the question of raising the water, which, however, can often be easily done by aid of a hydraulic ram. The walls are built of rough field stone, laid in ordinary foundation mortar, with the exception of the inner stonework and lining, in which hydraulic cement is used. The bottom is likewise of stone. The stone used for the inside of walls and upper course of bottom should be of smaller size than the rest, to effect a better handling of material, but the whole wall should be well bonded,

carried below frost, and plastered on the outside after the manner of ordinary house foundations. Another method would be to construct the wall entirely of cement.

Four to eight inch water pipes are used to bring the water from the brook and for the overflow and outlet. Water gates are provided in inlet and outlet pipes so that the pool may be filled and emptied at pleasure. In this way a constant flow of water may be had, water may be admitted and allowed to set and warm, the depth reduced for the youngsters, and the pool emptied and cleaned. It is important to remember that the inlet and outlet pipes should be of exactly the same size, and the overflow main from the tank to the brook a trifle larger.

Gate lodge at "Pine Banks," Malden, Mass.

In the problem where the possible level of the brook, after damming, reaches the required level in the pool, the pool and all its connections should be built first and the dam afterward. This will simplify the work to a considerable extent, as thus the problem of dealing with running water is in a measure obviated. It is well to remember that the dam, if on a level with the water in the pool, should be above the level of the brook below by a height equal to the depth of the pool plus a couple of feet or so. If such be not the case the water cannot be drained entirely from the pool, and thus its thorough cleaning becomes a more complicated matter.

Ice house at Kingston, N. Y., attached to the house motive

The gate lodge is not a nocturnal retreat for the man who dare not go home, although it may perhaps have been used for such purposes at times. It forms a sort of advance guard for the house, and is often considered as part of the gateway composition. It is occupied by the caretaker of the estate, ordinarily, and is thus a small cottage suitable for domestic occupation. Thus considered, it should have no real back, as an all-round view is usually gotten from some point or other. Such things as

may be necessary and unsightly should be enclosed within a small kitchen yard. Many examples of the English thatch cottage are excellent suggestions for the lodge. As a matter of fact, the gate lodge is used so comparatively little, and then only on the largest estates, and its purpose is so simple and on ordinary house lines, that its further discussion would be of little interest or instruction.

Old gates at Medford, Mass. An example of the classic influence in wood. Cost about $100

Nowadays the question with the householder is whether he will economise on fencing and open up his grounds to the tender considerations of the public, or whether he will build a barrier of sufficient formidableness to reserve a small fraction of his private estate for his own personal use.

It is far from necessary to go into a lengthy argument to prove that the public at large will make common property of anything foolishly left exposed. It cares nothing for an edge stone; a few will respect a hedge or low wall, and a slightly larger percentage will not climb a picket fence, owing to the difficulty involved. There are those, however, who will get on the other side, even if they have to resort to an axe or a scaling ladder; this class can be quietly killed and buried without awakening any great protest from the outside world.

As it is believed that privacy is the fundamental basis upon which the existence of private grounds depends, the edge stone or curb is hardly worthy of consideration.

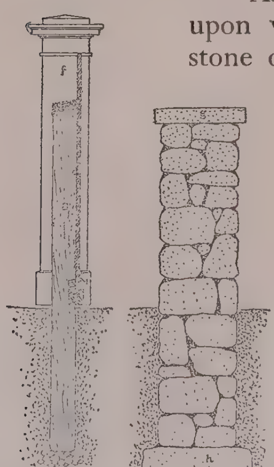


Fig. 54. Sections of simple wooden picket fence and rough stone wall

a. Fence post
b. Top rail
c. Bottom rail
d. Picket
e. Base board
f. Gate post
g. Cap stone
h. Footing stone

The next step is the wall (see Fig. 54). This is usually laid in rough field stone, quarry-faced ashlar or brick. All such work should be laid in one-third cement mortar, owing to its exposure to the weather; and care should be taken that the joints are weather struck, in the case of rough stone, so that water will not run into the wall. The foundation of all walls and gate posts should extend to from 3 to 5 feet below grade to avoid heaving from frost, and should be set on footing stones, projecting at least 4 to 6 inches on either side of the wall. Like the house foundation, there should be no projecting parts below ground for the frost to get a purchase on.

The treatment of the top of the wall is an important consideration. In the cases of ashlar-faced stone and brick, a stone cap is necessary. This should project an inch or so beyond the faces of the wall, and, if flat, can be made of slabs of slate or North River stone. It should

not be laid absolutely level, however, but have a slight pitch, in order to shed water. This pitch should be observed on all exposed work where the flat effect is intended. The cap stone is sometimes cut with a pitch both ways, like a low roof. The foregoing treatments look well, but on a low wall the ever-watchful public is apt to roost in flocks, if the place be particularly inviting; and it is perhaps better that the wall should be used as a foundation for a wooden or iron fence, a most durable and effective treatment (see Royal House gate).

An English lich gate, suggestive of cooling retreats within. Cost about $300

The high wall generally takes care of itself, being more or less hard to climb, but it is expensive and beyond the reach of common mortals. Such walls are frequently topped with broken glass bottles set in the cement in such a way as not to show from below, and are ugly customers for the trespasser. The low, rough stone wall is often treated with upright pointed stones as a coping, which effectively discourages the roosting public, although it is readily climbed.

In the building of the all-wood fence, care should be taken that the bases and all other woodwork other than the rough posts (which must be set in the soil) should set clear of the ground, otherwise they will be sure to decay (see Fig. 54). Wooden posts should have the footing ends either charred or tarred and set upon a bed of small, loose stones. It is better even if they be first charred and then covered with tar to from 2 to 3 inches above the soil. Do not fill in about a post with stone unless you wish to injure your chances of the hereafter, as the removal of such stones is not to be undertaken by church members. Otherwise than this it makes a good job. Cedar, which is lasting, should be used for the ordinary post. Chestnut is perhaps better, its lasting qualities being demonstrated in the old rail fences of familiar acquaintance. In localities where the locust post can be had it should be used; it has no superior. As in the case with stone or brick foundations, the fence posts should be set well below the frost.

Garden gate of Royal House, Medford, Mass. A simple wood and brick treatment, having many practical advantages. Cost about $35

The common form of wooden fence has the usual rough post as a support, and the top and bottom rails with a

crown mould or cap across the top of the pickets. Other types make a feature of the posts by boxing them in. There are numerous other forms of the picket fence, and other forms besides that of the picket; the range is considerable.

All finish wood should be of good, sound white pine or the above-mentioned chestnut. Spruce is sometimes used for rails, but is not recommended for the better work. The picket fence is a simple and effective form of wooden fence, especially if the picket tops are pointed. The ordinary form of this fence, with plain pine pickets 4 feet high, would cost from thirty-five to forty cents per running foot. The paint would cost, laid, about three and one-half cents per square foot additional.


Gate lodge at Lawrence Park, Bronxville, N. Y.

Clay is a very bad soil, as it is apt to heave and throw the fence out of line. In the case of wood, the posts can be driven down again with a maul, with fair success, provided the construction is such that the top of the post can be gotten at. In the case of stone or brick heaving is not so noticeable, but when it does occur badly there is no remedy but to rebuild. If the stratum of clay is thin the foundation should be set below it. This will obviate much of the trouble.

Rustic work in some cases can be used to advantage and be rendered very effective. Its real drawback is merely a question of durability. The effect depends on its original condition, and it cannot be repaired without showing the patch. All butts should be painted to repel moisture in the pores of the wood.

Hedges make good screens when placed a little back of an open fence; but where they are used alone, and unless they are planted with a wire fence next the roots of the shrubs, thus giving the grown hedge a nice core, they are easily broken and destroyed. A barbed-wire fence used as a core to such a hedge makes an effective barrier and is a good discourager of small boys.

If you wish to spend the most of your time in chasing stray animals out of your flower beds, small boys out of your orchards, and in persuading the well-meaning public that your main driveway is not a town road or entrance to a park or asylum for the insane, just build your entrance without gates. On the principle that every doorway should have a door, it would seem better that every gateway should have a gate. It can be left open or shut at will, but its entire absence renders the fence useless.

Gate posts of whatever material or design should be rigid enough to support the gates, both open and shut, and the same general principles of construction observed as in the fence. A gate post out of plumb is not interesting, either to look upon or to swing a gate from. The gate post is usually boxed in around a rough supporting post sunk in the ground. It has a cap and base, after the manner of some stair newels, and is more or less of a decorative feature in the composition. In less important gateways the post is often turned. The stone or brick post follows the same general forms, and should be solid enough not to tip over.

Gates themselves should be braced so that the sagging is reduced to a minimum. They should also have some sort of a rest to take off the strain when open or shut. A piece of bound stone, 8 inches square and set flush with the centre of the driveway, with a mortise to receive the bolt (fastened to the gate stile), of a pattern which will lock and at the same time support the gates, will be found effective in the case of the double gate when it is closed. The same thing can be used to hold it open. Of course the small foot gate, being narrow, does not usually require this.

The gate is usually made fast with a special latch, and sometimes embellished with a knob. In the latter case the knob should be oval rather than round, so as to afford a good hold in its manipulation for the hand.

Gates and fences should be so designed as to exclude all dogs and poultry, as much damage can be done to flower beds and the like through their visitations, and to this end should be close to the ground and the pickets set close together.

Posts to carriageways should always be protected by stone or iron guards placed against the bases on the inner or jamb side. This will prevent careless and inexperienced drivers from enlarging the gateway and carrying off samples of your gate posts on their wheel hubs.

Ornamental ironwork is often used to support a lantern over the gateway. A lantern is a valuable accessory on a dark night and may save a wreck of rig and anatomy, as without it one may try to drive through the fence at some unlikely spot.

Climbing plants are frequently used to beautify a gateway. If they are of a flowering variety they should be well within the grounds or high out of reach. The public, who will respect your purse, will take all that it can carry and come back for more, neglecting, however, to mention it at the confessional. It is not the loss of a flower or so, but the continuance of it, which destroys the looks and shape of the bush. Ivy and woodbine are seldom molested, and can be used with good results on rough stonework. Frequently a rose or wistaria arbour running from the inside of a foot entrance can be made a thing of beauty and reasonably safe at the same time.

Remember one thing: that all good bits of decorative design should not be too heavily laden with creepers. Such treatment is far worse folly than a woman's silk petticoat—you haven't even the rustle.

An interesting circular barn and stable. James Hunt, architect

The grand old summer house of the Colonel Isaac Royal estate, Medford, Mass. This, which is perhaps the finest old Colonia example in the country, has been demolished

A delightfully informal Italian pergola

CHAPTER XV

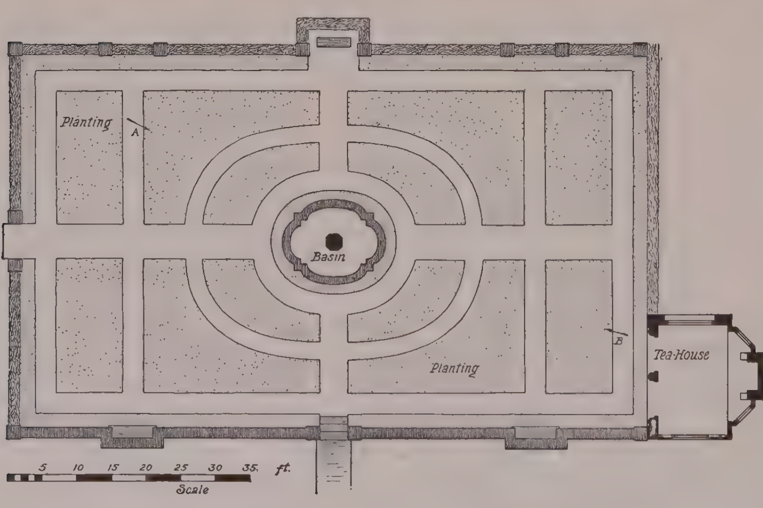
Gardens and Their Accessories

ALTHOUGH the subject of gardens is generally considered as a thing apart from the house, and is, in the ground that it covers, much too bulky for thorough treatment in this work, yet a brief description of the relations of gardens to house and of their several types may be of interest, and is far from out of place.

The first statement, that the garden is generally considered as a thing apart from the house, is unfortunately true. The house having been built, the garden is then considered, and the owner makes a cast about to find a suitable place to put it—just as if it were a prize cow to be pastured. Now, if it be desirable that your house be set in surroundings as foreign as if they belonged to your neighbour, follow the lines of the above course and you will gain your end. If, on the contrary, you desire that your house and other buildings shall form with your landed accessories one whole and complete composition clear to the limit of its bounds, then it is highly important that the scheme of such a composition be thoroughly thought out and decided upon before the building site is disturbed in any way. It is important, too, that the general layout be done either by the house architect and landscape architect acting together, or by one party who thoroughly understands both professions. Unless this is done,

the gardening is handicapped by the house, and the house does not have the advantage of the garden setting to aid in its planning. The service that the two professions can render to one another at the start is not to be underestimated.

The Blair garden from point "B" on plan. The tea house is placed in the corner to get this view of the mountain



Plan of Blair garden at Bar Harbor. Much of the actual plan effect is gotten from the terrace of the house, which is considerably above the garden level

Often it results in practically the saving of the whole scheme.

The trouble with the ordinary landscape architect is that his understanding of architecture is so comparatively limited that his accessories are usually far from satisfactory. Thus, in his attempt to solve the complete layout which should thoroughly harmonise with the various

buildings to be considered, he is handicapped at the start. While on the other hand, he of the architectural profession who plunges blindly into the numerous pitfalls of gardening will make even a worse botch of it, if the thing be possible.

In the old examples the complete outlay was done by the architect, and the venerable monuments he has left to his genius testify to the success of the single brain. However, let the designer call himself what he may so long as his understanding of these two (unfortunately separated) professions shall enable him to plan and execute the harmonious whole. Let us hope that the present tendency to reunite these kindred arts shall result in the future designer becoming a master of both. This has already been done to a limited extent, and though it has been attended by many failures it has also produced most excellent results.

Garden of Mrs. D. C. Blair at Bar Harbor, Me. View taken from point "A" on plan, showing the fountain and tea house. Andrews, Jaques & Rantoul, architects

We have already spoken of gardens as being the whole exterior outlay of the estate, and this is as it should be. The common usage which distinguishes between landscape gardening and formal gardening is merely an attempt to distinguish between the informal and formal treatments. The naturalistic arrangement of trees, drives, etc., is just as much a gardening problem as is the regular and more artificial "garden."

The former treatment is as a general rule much more apt to be successful as well as a far easier problem, inasmuch as it follows more closely the lines of natural conditions; while the latter, departing quite frequently in a considerable degree from

Japanese fountain in the Blair garden

natural models and depending almost entirely on the poor invention of man, involves the most careful thought and study and runs a greater risk of absolute failure.

The most important principle governing the laying out and the perfecting of an estate is that, whatever be the treatment, it should always look to be a natural part of the landscape, with an undisputed right of existence in the locality in which it has been placed. If this is not observed, it will swear at everything within sight, leading a profane and unnatural life so long as it shall exist.

Garden steps. Estate of Mr. Frank Squires, Greenwich, Conn.
Wilson Eyre, architect

With very few exceptions, the formal gardens of this country are lacking in the above respect; they have no connecting link with external characteristics. There are two ways of obviating this unfortunate and false condition: first, by making the garden conform strictly with the landscape, so that in looking from one upon the other the sensation shall be one of pleasing transition; and second, by enclosing an entirely foreign or artificial treatment in a suitable enclosure of trees or shrubs in such a manner that both the garden and the natural landscape cannot be seen one from the other or both at the same time, either from the normal ground level or from an elevation.

A most excellent garden screen is that composed of silver or Lombardy poplars. This tree is naturally of regular shape and requires little pruning. It is also a rapid grower. The spruce, pine or cedar may also be used. The treatment is perfectly legitimate, and if rightly handled the beholder suffers no shock in passing from one condition to the other. The garden in fact becomes a delightful glimpse of another world—a bit of fairyland. In this way a garden on the lines of the Japanese can be introduced without danger of interfering with the general scheme of design.

While this suggestion as to the installation of the isolated garden of foreign character is the only way in which it can be successfully treated, yet the usual and perhaps the best method is to consider the garden in composition with the house, and as such in connection and in harmony with it. This does not prevent, however, the existence of the garden of foreign character in another part of the estate, but such a garden is usually a toy.

This consideration of the garden and house as one motive would seem to be the correct one where only one garden is contemplated. With intelligent treatment the effect of the house from the garden, and garden from the house, introduce so many features in the way of accessory that both are greatly enhanced by the association. Naturally, the whole being considered as one composition, the architectural rules governing line, scale, balance, proportions and colour apply to the garden as well as to the house, and naturally, too, these effects are gotten largely through the medium of lesser architectural motives, commonly called garden accessories. Not only do these accessories serve the above purpose, but also through their agency are the garden masses tied together, as well as to the house.

We naturally first consider the garden from the standpoint of the plan, and the less complex this may be the better will be the final result. It is important, too, that it should always take advantage of and mould itself upon the natural conditions offered by the site and the visible suggestions beyond its bounds.

Perfect as the plan may be, it may fall flat in the faulty disposition of accessories or through poor planting, or through both. Accessories being a more or less permanent feature, are more difficult to rectify in case of failure than is the planting. This last, considering the diffi-

Garden wall at Greenwich, Conn. Estate of Mr. Frank Squires. Wilson Eyre, architect

Pergola and sun-dial on estate of Mr. Frank Squires, Greenwich, Conn. Wilson Eyre, architect

culties attending the changing of trees, shrubs and hedges, is more flexible in the fact that yearly planting of flowers makes radical changes possible without an overthrow of the whole garden scheme. Every one of us, be he Christian or heathen, should offer up one prayer of gratitude for the blessing he receives in the flowers. There are few too depraved not to appreciate them, and there are few too honest to steal them if a favourable opportunity presents itself. This general love of flowers has imparted to the American garden its greatest source of beauty and charm—its one human touch. Even with flowers, however, the results of poor planting will render less than useless a good and valuable agent in the general harmony of colour.


Garden gate at Glen Ridge, N. J.
H. Van Buren Magonigle, architect

While trees and hedges (not flowering) should be considered from the point of their size and shape, they usually count as being permanent green motives in the general design. There are, of course, instances where variations of colours, both in leaf and a limited period of bloom, may well be considered. It is the flower, however, that requires the most careful study. Added to all ordinary considerations of the tree and hedge are those of colour, quality and length, season of bloom, as well as the proportion of colour in contact with possible foliage. With these many varying and passing agents it is desired to construct not only a colour scheme that shall be harmonious for the entire season, but an able accessory which shall preserve both the lines and contour of the planting. It stands to reason then that the successful gardener must know just a little of flowers and their ways, and that he who has only a general knowledge is doomed to certain failure.


Hermes, at "Maxwell Court"

As it is largely a scheme that is desired, and also as such scheme with all its variations is hard to carry in one's head, the best method would be to make a colour plan for each month of the flowering period, which should show the proportionate areage of the blossoms to foliage and

whether the blossoms be massed or separated. The transition from one bloom to another should be carefully noted, so that no inharmonious note shall occur in the general harmony of colour. As such plans are only valuable as far as immediate contrasts are concerned and show what may occur in actual perspective (in the silhouetting of one mass against another), it is well that a small scale model of the garden be used with them, to the better understanding of natural conditions. This model will serve also to study scale and distribution of the garden furniture.

"Maxwell Court," Rockville, Conn. Looking from the terrace toward the garden. Charles A. Platt, architect

In the choice of flowers, it would seem that wisdom should tend toward the native and hardy sorts. These are numerous enough to offer sufficient variety, and are at the same time inexpensive, both as to care and initial cost. In placing, the most common arrangement is that of locating the taller varieties outside the outside walk and diminishing the average heights as we go toward the centre. This is the simple method, although in some instances it may be advisable to bank them about some central or standing motive like the summer house, free columns, hermæ or the like. Small, isolated groups of tall flowers unsupported by some feature of accessory are seldom happy effects, and tend to break up and destroy the simplicity of line and contour which is so effective in the well-planned garden.

In the disposal of colour, white, yellow and red are the usual dominant notes and can be used most effectively. If the gardens have a particularly interesting layout of walks, it can be emphasised by small and low white borders. Either

red or white may serve to strengthen corners and centres, and it is almost imperative that one or the other be used in a considerable solid mass, to reinforce the central feature or to serve as a foil to the same.

A vase at "Maxwell Court"

In the combined problem of house and garden, the house itself is supposed to count as the principal accessory, but this is the sense of two opposing forces forming a contrast in their junction. The major architectural motive in the garden proper is usually located at the opposite end to the house, in the centre of the sides or less frequently in the middle. The lesser features are spaced relatively to the larger motives, as the composition suggests.

Italian and English gardens require more or less accessory, it being a requisite of the style. Colonial gardens, on the contrary, being perhaps more strictly flower gardens, require but little of this sort of embellishment. Where the garden is modelled after some distinct style, the furniture should be of that style or of the style from which the garden is derived. Hence the Italian garden, being founded on old Roman and Pompeian lines, might well be furnished with furniture of these periods as well as that of the Renaissance. A jumble of plunder from the four corners of the earth is not desirable in a garden. It is no museum, in spite of the fact that it is frequently treated as such. The natural lines of the garden suggest emphatic spotting at certain points; what is done beyond this is superfluous and harmful. If the top of the wall is to be the receptacle for pots, statues or architectural fragments, that portion below it should be emphasised by either post or pilaster effect, suggesting that such furniture really belonged there and has support.

Of the numerous types of garden accessory for ordinary conditions, there might be mentioned pergolas, arbours, trellises, summer houses, fences, walls, gates, seats, steps, sun-dials, fountains, statuary, pots and urns. In rare cases tea houses, isolated dens, studios, towers, windmills, dove-cotes, bridges, free columns and lanterns, may be used to considerable advantage. In the tying of the garden to the house, several natural features of the latter are used which in themselves suggest introduction to the open air. Thus the porch, veranda and piazza, or their variations, serve well this purpose, and at the same time make their own excuse for existing more secure in so doing. To break the hard line of intersection between the house and garden, vines, etc., may be used, but it is essential that too much of the architectural detail is not hidden or the light cut off from the house by this treatment.

As the effect of the garden is benefited by being much lower than the house level, the link between the former and the porch or kindred motive is attained through the medium of the terrace, which involves steps and, perhaps, walls and

buttresses. The fact that the house level is above that of the garden lends to the perspective of the latter, inasmuch as the design of walks, planting, etc., will count to better advantage. This effect, while excellent, should never be gotten by evidently artificial means, although much can be done artificially that does not count as such.

Wall of entrance court showing wall fountain, "Maxwell Court." The oak growth back of the wall forms a most excellent screen to the estate

The lines of the house are best continued by the use of walks or fences, the use of hedges alone being hardly of enough contrast to make an emphatic line at all seasons of the year, while it may answer for the brief period of its bloom if it be a flowering hedge. There is no objection, however, to reinforcing the former with the latter if desirable.

The pergola is of Italian parentage and, like its numerous dissatisfied brethren, has found its way to the land of freedom. It consists of a flat lattice roof supported by columns, and may be a free and independent motive, be used in connection with the house, or perhaps be a composite of both. Varying as it does from severe classic lines to those of the most informal, it offers a considerable range of treatment. The supporting columns may be of stone, brick, plaster or wood, while the lattice work is of the latter material. Some of the less formal Italian types, in which the columns are made of rough plaster of simple design, with a rough pole

"Maxwell Court." The garden gate

lattice, are excellent and inexpensive models for adaptation for our less formal houses. They also have the advantage of being possible for the home mechanic.

This last form may be constructed by building a round wooden shell about an ordinary fence post set in the ground in the usual manner. This shell can then be wire lathed and rough plastered and a square 2-inch cap placed on top. The lateral beams may be of 4″ x 6″ Southern pine set on edge, and the lattice of rough cedar or birch poles from 2 to 3 inches in diameter, as the case requires. These spaced 20 inches apart, running crosswise and projecting from 30 to 40 inches on either side of the beams, form a support for the lighter lateral strips of like material. The best method of attaching the poles to the lateral beams is by the use of hemp rope about the size of large clothesline or slightly larger. Inch holes bored through the lateral beams under the bearings of the cross poles, and about 2 inches below them, will serve as holes for the lacings. Use plenty of rope and make parallel windings, and tie securely on top. It is well to dip the rope in raw tar, that its lasting qualities may be increased, or perhaps a ready prepared rope may be gotten. The ends of rope when tied may be secured to the poles by means of small galvanised staples. Paint the ends of the poles a dull red or ochre. Such a pergola might cost from $5 to $10 per post, and the beams, poles, etc., about one-half more. It should be remembered that as the pergola is intended as a support for vines any excess of architectural detail would be lost, and that consequently the most successful types are comparatively simple.

There is a well-founded superstition that there is no design to that good old relic of Colonial days, the arbour. But although the bulk of the local examples have evidently required little effort in their planning, there is enough outside of this which suggests the charming simplicity of the Georgian period. This old-time notion, borrowed from England, and by the English from the Italian pergola, is essentially a feature of the Colonial garden and serves but one purpose, that of primal interests—enclosing and shading a walk. It might perhaps be built with inside lateral seats, if desired, at a slight increase in cost.

The arbour, as will readily be seen, is a kinsman of the pergola, but differs from it in the fact that the sides as well as the top are usually enclosed with lattice. Thus entirely enclosed by vines, it frequently offers a pleasing method of traversing uninteresting space to that which is more interesting.

The common form has an elliptical roof. It might be built of 4 x 4-inch uprights, 4 x 6-inch lateral beams or plates, with 2 x $\frac{7}{8}$-inch lateral strips on top. The elliptical ribs or rafters could be of $1\frac{1}{4}$-inch stock, and the side lattice of $\frac{3}{8}$ or $\frac{1}{2}$ inch stock. Such might be constructed for $2 or upward per running foot.

The trellis, once a hackneyed, and commonly an ugly, feature of the period that has passed, has left to us enough that is suggestive of good to demonstrate that it can be made a neat and simple feature of the garden of to-day. Ordinarily it was a meaningless vertical contrivance of crisscross slats, but its possibilities are beyond this. Although intended for the support of vines, and frequently used on either side of the front door, it can be made of considerable length, and may serve as a screen where such be needed. It belongs, perhaps more fittingly, to the Colonial design, and will probably lend itself to more practical use under such conditions, although it is more or less used in English work.

The summer-house is more particularly an English or Colonial accessory, and is perhaps an outgrowth from the small Classic garden temple. On Georgian lines it can be made an architectural gem, and even the rustic type is extremely interesting; a simple form of this may be built for about $25. Unfortunately good existing examples of the Colonial summer house are rare (the excellent example shown on page 272 has been demolished).

A side porch showing the relation of the garden to the house and method of tying in

Where used, the summer-house frequently serves as the chief architectural embellishment of the garden, and, with the Colonial design, this was its rightful place. Under ordinary circumstances it should have a flooring at least one step above the ground; the more dignified and upright types require more elevation.

The fence, as associated with the garden, is more properly a balustrade, and is generally on the scale of stone rather than wood, even if constructed of the latter material. Sometimes used independently, it frequently serves as an attic to the garden wall, and more particularly where such wall is high and used to retain an embankment. In such cases it should be secured to the wall by anchor irons built into the masonry.

In wood its construction is best of the made-up type, that is, as far as posts and rails are concerned; the balustrades are of course turned. A simple form of wooden fence could be built for from $1.50 to $2 per running foot.

The wall which serves to enclose the garden may be high or low as occasion demands, and is constructed of either stone or brick. Such construction should be substantial according to its use. The well-laid wall is often a thing of beauty in itself, and for this reason it is not advisable to cover it entirely with growth.

In its uncovered state, too, it frequently serves as a flat-toned background for shrubs or tall plants like the sunflower, dahlia and hollyhock with most pleasing effect.

From English sources comes the suggestion that a retaining wall of dry-laid stone may have planted in the joints small flowering plants. Naturally such specimens as are indigenous to the rocky crevice should be selected for this purpose. There seems, however, to be a tendency on the part of our Eastern brother to overdo the thing in a continuous treatment of the entire wall, and it would seem, too, that the scheme is good enough to be saved by limitation. Hence the wall laid partly dry and partly in mortar, after a previously arranged planting plan, would save this excellent suggestion from becoming cheap and commonplace. By the use of small and large stones a greater or less area of colour can be gotten, as well as some suggestion of pattern.

Old Prince House at Flushing, Long Island, showing entrance to terrace through the arching box growth

It is important, however, that the beds of the dry-laid stones shall incline slightly downward from the face of the wall to allow of the retention of such moisture as may find its way into the intervals of soil. It is possible to apply the above to a brick wall by the omission of bricks at intervals, as the construction may allow.

All walls should be surmounted by a stone capping, and for ordinary purposes the 3-inch slabs of North River stone serve well for both stone or brick. This capstone should project slightly beyond the line of the wall both front and back. In like manner the wall is built on a stone foundation, after the usual manner of house walls, with heavy projecting footing stones. This should be sunk below the frost level. A brick wall 16 inches thick, with one exposed face of water-struck brick, may be estimated at about seventy-five cents per square foot of exposed surface.

Garden steps should be easy; that is, of slight rise and increased tread. A 5-inch rise and a 15-inch (or even more) tread is suggestive of ease. For the extremely formal garden they may be entirely of stone or brick, or with stone nosing and brick tread. As the severity of style relaxes, they may even be made of hard-packed earth, held in place by fairly rough stone nosings or risers, and to insure their lasting qualities irregular flat stones may be introduced in the treads after the manner of the Japanese stepping stones. In extreme cases the irregular flat stone may be used alone with excellent results.

The suggestion for wall planting can well be applied to the steps, but, as in the former case, moderation should be observed, and never in a way to detract from their usefulness. Such planting is more particularly adapted to the less formal types, and yet a limited treatment of the more severe examples will tend to break hard architectural lines, tie the motive to the garden, and relieve that extreme effect of newness or lack of mellowness which usually pervades the outlay. We all know that the hand of time adds interest and picturesqueness to the creations of man, and for example we have but to turn to the beautiful Italian gardens to see how Nature has added to their charms in the reclaiming of her own. We doubt much if in the extreme freshness of their youth they were half as interesting or impressive. It is that little touch of Nature, be it ever so slight, that puts the final brush mark upon the works of man, and the designer who invites, aids or considers this shows himself a master, by the acknowledgment of a higher power than his own.

A rustic summer house

Seats were intended to sit upon, strange as it may seem. In our Northern climate, however, stone is but a chilly friend for the wearer of ordinary clothing. The stone bench of Classic origin is all right for climates like that of its native soil, in fact it is apt to get extremely hot, but as we get further from the equator the introduction of a wooden cushion between one's anatomy and this unsympathetic detail of Classic design holds more common sense than poetry. This will probably shock the purist, and his ire will be increased when it is suggested that the stone slab be replaced by wood (which is in violation of good usage, inasmuch as one material is made to suggest another). However, the damage to our feelings is apt to be less in this last instance than the chilly personal contact already suggested.

Stretching the point still further, the less important seat may be made entirely of wood. A 2 or 3 inch plank may serve as the seat proper and the end supports be made of 4-inch stock. Modelled

The garden at Mount Vernon. Beyond the beds of quaint design are the hedge-enclosed garden plots where old-fashioned flowers bloom

after simple Classic lines, such a seat could be made for $12 or so. It is well, however, that it have a stone base and be fully protected with spar varnish.

Garden seats may be in a variety of forms, as suggested by conditions. They may be simply isolated seats, or partially enclosed and covered by a semi-pergola motive. They may be built about a central umbrella motive or let into niches in the wall. In any case it is advisable that slab seats should crown or pitch to shed the water, thus accelerating their drying, or where practical the seat may be made of closely placed wooden slats to effect the same end.

If there be a judgment day, we pray that all sculptors who have perpetrated hideous and unhealthy fountains shall receive just punishment. It is not a pleasant sensation to look for a moment upon a person writhing in the agonies of a violent poison, but to have the horror perpetrated in marble or bronze and erected as a detail of a fountain is unbearable. To emphasise the play of muscles, no doubt, the anatomy is contorted with lifelike realism and, to crown all, the nightmare is actually ejecting the cause of his troubles—pure water. This phase of sculpture may be strenuous and good art, but of the two evils we much prefer the type of chaste maiden who reverses her funeral urn to drain the stagnant water therein collected.

Sculpture is allowed a certain decorative license as regards grotesque and allegorical interpretations, and these things are well, provided they be not carried to the point of being repulsive. The sculptured goose, swan or fish may serve to throw a limited jet of water to a limited distance, while the human and animal masks may be used in like manner, but each should look capable of the task imposed upon it. As an example of the unnatural delivery of water, take the two flanking figures in an Italian garden—one of the fountains of the royal palace, Caserta. In this an urn, inclined slightly upward, delivers a small and powerful stream which carries well over the cascades and into the basin. This is not the natural delivery of an urn, and is consequently false and ludicrous. It is far better that a simple ornamental water head be used than that such startling illusions as this be tolerated.

The Italian well curb, or "pozo," in the centre of the court of Mrs. Hearst's hacienda

For the uses of the ordinary American garden the fountain should be comparatively simple, and a very good suggestion has been offered—that the basin be constructed with an outward flare and without moulding on the inside, so that lifting ice may not crack it. It is well, too, that the water should be fairly close to the rim, and that its depth be not over 2 or 3 feet, also that stagnant water is not desirable.


"Maxwell Court." The pergola from the outside of the garden

The shut-off should be located in the shrubbery or some other convenient place where it will not be a noticeable feature. The fountain is set on a solid, sunken base, under the finished basin. The basin itself may be lined with hydraulic cement, laid on brick or rough stone. It is well that this support be firm and solid, otherwise the basin may crack and leak.

The sun-dial is an old garden feature which can well be used in any American garden, although being more particularly suited to the English and Colonial types. As a small bit of accessory it is excellent, and often in a very small garden may form the central motive. It should, however, be placed in such a position that it will serve the purpose intended of it, and to this end it should be carefully and properly set.

In setting the dial it is necessary that the base be absolutely level; the placing of it in position at exactly noon, at the proper angle to the sun, is an easy matter. A reproduction of the old brass dial may be procured for $10.

The use of statuary should be limited, and its selection most carefully made. The reasons that make it advisable to eliminate the hideous from the fountain should be borne in mind, and a severe line be drawn at "death agonies" and the like. The most natural representations are those of the faun, nymph and satyr. Mythology suggests much that is good for the garden, particularly those already mentioned. There are of course other forms more or less fitted for the purpose, but the owner should use his best judgment as to their fitness.

Garden pots are used as a receptacle for shrubs or small decorative trees, and the combined motive is exceedingly valuable in marking emphatic angles of the design, in which case they are usually placed directly on the ground or a flat base provided for them. They are also used on the top of walls or fences, in which case they should be over a post or pilaster. Several of the old Roman

pots have been reproduced in this country, and are in every way as desirable as those made on the other side. A most excellent design, of large size, having the four masks and connecting festoons around it in high relief, can be bought for $50; smaller and simpler patterns for correspondingly less.

Sun-dial in cedar garden of R. L. Stevens, Esq., at Bernards ville, N. J. Daniel Langton, landscape architect

The urn is usually more elaborate than the pot, and as such requires less growth to make it interesting. Sometimes, in fact, it may be advisable to omit the growth entirely. The proper place for the urn is that of slight or fair elevation, usually on top of a wall or fence post, at least not on the ground. The old Italian oil jar has been used to considerable advantage, and its plain, simple lines are excellent.

The use of the free column has been much abused in this country. The American garden is not the place to reproduce ruins or partially restored Pompeian effects. The architectural column should have something to support, even if it be nothing more than a sphere or decorative eagle, and even then it often has no excuse for its existence. A column of fair size may be used, oftentimes, as a support for the wistaria or trumpet creeper, especially when it is advisable to carry a mass of colour above the ordinary height. Being thus used it should be simple, and may be surmounted by an armillary sphere, or skeleton globe, which would insure the massing of foliage and flowers at the top.

The free column may be a made-up affair in wood, supported by a post set in the ground. The globe at the top may be made of three good barrel hoops placed after the manner of the meridians, and having a fourth hoop round about them after the manner of the equator. As this skeleton is supposed to be filled and intertwined with some climbing vine, the hoops answer the purpose very well. A made-up column 15 feet high and 15 inches across at the base, with simply moulded cap and base, can be bought for $25.

The old Classic device representing the head of Hermes on a tapering shaft about the height of a man is frequently used in pairs to mark the beginning of a walk. He is often represented with double heads, back to back, and in this form it is not advisable to turn one or the other of his faces to the wall.

The garden lantern may be said to be distinctly a feature of the Japanese garden, but it can be used elsewhere if desired. The garden may be made extremely interesting at night by the use of lanterns placed on the side or top of the

wall. In fact, the chances for emphatic effect through the agency of artificial lights are most numerous and varied, and offer an enticing study for the designer.

Old Japanese lanterns cost considerable; a cheap substitute may be made at little cost from Portland cement. This should be constructed so that the lantern part can be lifted from the base, allowing a candle to be placed in position. It can also be wired for electric light or piped for gas. The Japanese use silk or paper for their windows; for the cement reproduction American stained glass is as effective, and far more durable.

A vista in the Stevens garden

There are frequently conditions which naturally suggest the bridge. It may be only a tiny affair, or perchance it may be of some size and pretension, but the owner should at once recognise this special privilege and treat it with care and discretion. Although the rustic bridge is often effective as a bit of design, it requires constant care and frequent repair; rough stone should be used in preference. More regular stonework and brickwork may be used in cases of formal treatment, and of these the stone is to be preferred. Frequently the bridge may be partially covered by growth, much to its advantage.

One must not underestimate the importance of the garden gate in the general scheme of design. It is the connecting link between inner and outer conditions, and as such bears upon its shoulders much responsibility. Through it is seen the garden on the one hand, and the outer and commonly more naturalistic conditions on the other. That it should harmonise thoroughly with both goes without saying, and that on this account its mission is often difficult is also clear. It may take the form of a mere opening in a solid wall, or become a more studied detail in connection with the screening fence.

A simple and neat wooden Colonial gateway may be constructed for $25 and upward; any amount can be spent, if one wishes, without complaint from the carpenter. This is one of the few cases where this gentleman is dumb; his is simply to "say nothing and saw wood."

Seat in the Stevens garden

That the reader may form some idea of the most common models upon which the American garden may be based, a brief description of their several characteristics will serve to show their distinctive differences in scheme of design.

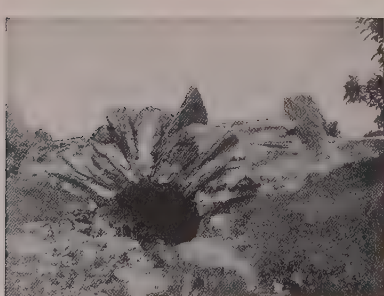
Renaissance architecture being a revival on Classic lines, it naturally follows that the garden with which it was allied should also be drawn from the same source. Consequently such ancient

Roman ruins as then existed, borne out by descriptions of them by Cicero and Pliny, formed the basis of design for the Italian garden. The main fact which at once strikes the beholder is that it is an architectural effort in which even Nature herself has been conventionalised, to the end that both garden and villa should be one complete and harmonious architectural composition. In this scheme it was only natural that the trees should be trimmed and clipped into forms more or less antagonistic to their natural growth. Of course Nature has in a measure reclaimed her own, and it is now difficult to determine conclusively just to what extent this conventionalising extended. It is safe to say, however, that, in our eyes at least, the existing suggestions are preferable to the original lines.

As to the architectural embellishment of the garden, it is natural that the antique sculpture of the Roman garden should find its way into it, but the Italian, being a collector, often overcrowded his garden with much that really had no place there, thereby making of it a veritable museum. Such antiques, being in reality a part of the history of the country itself, had a more or less natural refuge in the villa garden, while the appropriateness of such plunder is often questionable in the American garden.

Properly speaking, flowers are not a feature of the Italian garden. The old monastic examples grew only such as could be used for practical purposes. In them flourished such flowers and herbs as had medicinal properties, and some specimens of the former that could be used in the festivals of the Church. On such lines as these vegetables were naturally cultivated.

An ivy-covered stone bridge

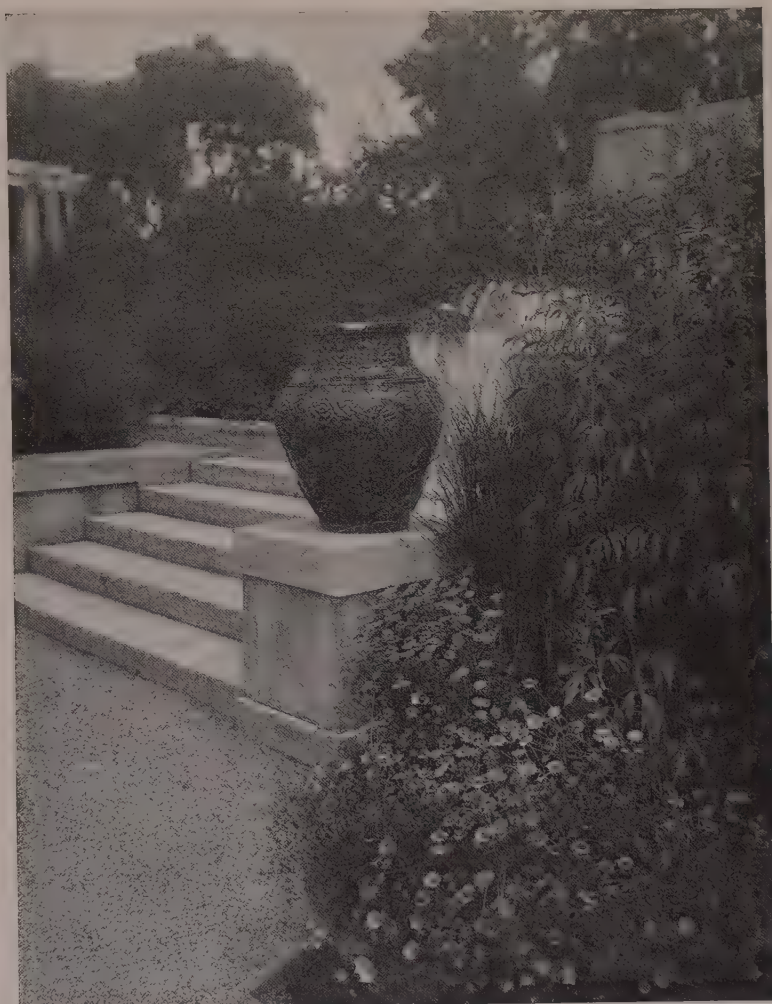


A rough-stone bridge supporting a drive

The main features of the Italian garden are its sloping site, in which three, rather than two or four, terraces are used, the architectural treatment of the emphatic points of the design, the use of running water both in cascades and fountains upon each distinct level of the motive, and the formal treatment of such flower beds, hedges and avenues as are deemed necessary to the proper setting of architectural motives. Each terrace is faced by a stone retaining wall, capped by a balustrade and connected by broad stairways. The garden is enclosed, and is usually of about 10 acres, in which its length is two or three times its breadth. The long axis follows the slope of the hill on which it is situated. The entrance is through the wall at the lower level, in which is the flower garden. On the middle level is the most important and central feature of the garden design—the house, or casino with its architectural accessories. Above this, the third level, is the more naturalistic treatment of trees, which serves as a background for the central architectural feature as seen from below.

This briefly is the typical Italian garden, architectural in its treatment and

festal in its character. It is a beautiful and expensive toy, rather more perhaps than the average rich American would care to carry, and yet suggestive of much that can be adapted to smaller and less pretentious problems. The American, being a man of business, has little time to enjoy such an extensive outlay and is contented, perhaps wisely, with the smaller luxury.



Stone steps in a formal garden. Flowers soften the lines of architecture

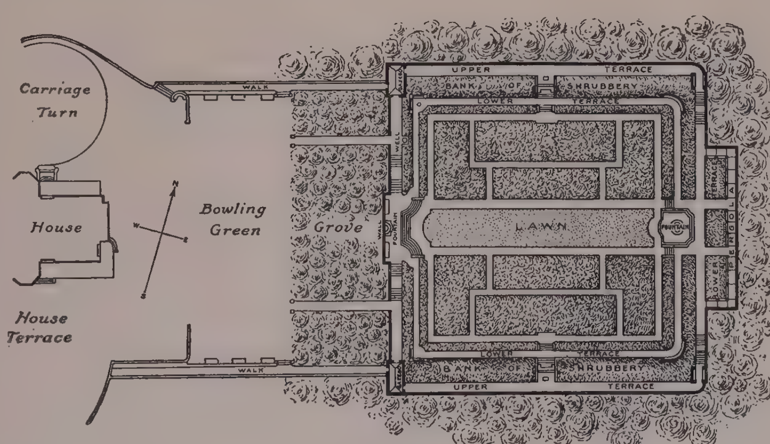
In comparing the English garden with that of Italy, one is struck by the domestic qualities of the former. The conscious effort for effect so noticeable in Italian and French gardens is lacking, and, although these two are superior to the English garden as examples of the higher art of scientific gardening, they nevertheless suggest too much of the festive and public function to be in accord with the domestic temperament of the Anglo-Saxon. The earlier work was influenced by that of Italy, and from this we have the formal terrace, walled garden, bowling green, clipped hedge and the architectural accessory. Naturally, from the character of the country, the terrace was perhaps more flat, and this general flatness extended to the whole outlay. The details of accessory were simple, and such accessory less numerous than in the Italian type.

Although the English gardener has frequently gone to extremes in the matter of clipping, and evolved from perfectly harmless and innocent trees most hideous and awe-inspiring effects, yet the better and simpler forms are rather pleasing than otherwise. He has respected in a great measure the right of trees

Garden of Mrs. Larz Anderson, at Brookline, Mass , showing treatment of end toward the house. Charles A. Platt, architect

to their own form of growth, and it is only with the smaller variety that he has taken liberties. He has, with the aid of certain informal details, arrived at a formal result, and the whole has been effectively tied and blended by the extreme formality of small details. What he lacks in the way of the sculptured accessory of the Italian he has made good in his love of flowers, and in this comes that human note so harmonious with domesticity.

The English garden is planned with the idea of utility first and beauty afterward, not that the one is sacrificed to the other, but that the latter consideration is used to clothe the framework of the former. A requisite of the English home life requires approaches and courts to gain access to the house. There is the main approach and that to the kitchen and servants' quarters, neither of which are considered desirable as outlooks. The chief living rooms, then, are naturally opposite these and overlook the most favourable aspect. The privacy of the separate approaches and the garden proper is obtained through the medium of walls and high hedges. From this it will be seen that the house is naturally in the interval between the entrance and service court on the street side and the garden or "forecourt" in the rear, and on which the living rooms of the house face. As has been stated by one writer: "The place is considered as an outdoor house. The grounds are divided up according to their use, and each portion has a well-established boundary." Thus the entrance courts, kitchen garden, stable and yards, lawns and pleasure grounds are laid out as best serves their several purposes. Although this subdivision is very apt to be on the lines of an unbalanced plan, yet the details of the decorative outlay are formal. This may be a rather meagre description of the typical English garden, but it should serve to show the chief considerations in its planning.



Plan of the Anderson garden and its approaches. Notice its square outline, the pergola at the eastern entrance, the central strip of lawn, and the three levels which supply the changing viewpoint. Also how the grove hides the garden. Length of garden, including pergola, 206 feet; width, 196 feet

As old Colonial architecture was but the English revival of the Classic and Renaissance, usually called "Georgian," it was but natural that the Colonial garden follow after the English models. But the former type usually differs, in a measure, from the marked extremes of the parent style, as it was natural that a plantation should differ from an English estate. The plot is usually level and the general plan extremely simple, and, as far as the old examples of the James River suggest, the terrace did not exist. In some old New England examples, the garden was on

a lower level than the house, but in itself it was of flat contour. The enclosing wall was replaced by the hedge, and it is evident that clipping, except in the case of box hedges, was not carried to excess as in England. The "box" hedge formed an important feature as an enclosing border for the various plots and as outlines to the often intricate patterns of the flower garden. In fact the Colonial garden was a flower garden, and in this lies its greatest charm. The whole scale was one that seemed to fit the individual and give it the feeling of home. Its broadest paths were never wide, and its narrow ones allowed only width enough for one person. Ordinarily the paths were flanked with box or flower beds, or both.

Fountain in garden at "Fairacres," Jenkintown, Pa. Wilson Eyre, architect

The garden accessories were few and simple, consisting of gates, arbours, summer houses, tool houses, sun dials and frequent trellises. Although formal in character it was not necessarily regular, yet regularity was the rule rather than the exception, and the balance in the question of detailed motives was generally preserved.

It is perhaps the Colonial garden that appeals more strongly to the average American than any of the more elaborate foreign examples, and as a formal garden it is evidently nearer within the reach of the purse of the average garden lover. Owing to its small scale it can be reduced to a small size with considerable effect, but it should never be used with any but a Colonial house, and the architects tell us that the Colonial architecture is out of style again. We do not believe that is entirely true, in spite of the fact that the wholesale reproduction of this type has fallen off within a few years, to the preference of English designs. There is too much that is distinctly American in the Colonial, both in the comfort of its plan and its wholesome appearance, for it to become extinct. If ever we evolve a distinctly American style, it will be found to contain more of the Colonial blood than any other.

As the Spanish garden is well adapted to our Southern climate, and more particularly to the old Southwest territory once owned by Spain, it is important that it should receive some consideration. In this it is perhaps well to consider it from the standpoint of what has been done by the Spaniards themselves in southern California.

The best and only example in any sort of state of preservation is the famous Mission of Santa Barbara. This interesting old structure was begun in 1786 and completed as it now stands in 1822. Like many of the similar Spanish

A bit of the rock garden at "Yaddo," Saratoga, N. Y. This shows an interesting handling of simple material. The use of poplars is an important feature

A modest gate glorified by an arbour of wistaria

monastic structures, this edifice was in plan a hollow square enclosed by the church on one side and flanked by two wings. The side opposite the church was evidently bounded, or so intended to be, by a wall which, with the buildings, enclosed the garden. Along the three sides of the court adjacent to the buildings extended a cloister. The Spanish house is similar in its arrangement. The central motive of the garden is a very simple fountain with a raised curbing, characteristic of most of the Spanish examples, and paths radiating from this on the diameters and diagonals of the quadrangle. The planting, while somewhat irregular in its present state, is nevertheless interesting, and the whole thing suggests the privacy that is intended. This plan is similar to most of the Spanish-American work and, as already stated, follows the lines of the parent country. The scheme is evidently borrowed from the Pompeian, and is in harmony with their ways of living.

In the average Spanish garden the central motive is either a well, basin or fountain, and in each case the curbing is raised. Some examples show the use of small clipped hedges and walks on lines which suggest the Colonial, but the illusion is only momentary, owing to the presence of tropical foliage. Through

Moorish influence the Spanish garden often contains a long, narrow pool running from side to side, and flanked at frequent intervals by nearly upright single jets of water playing into it. The effect of this is very interesting.

The Japanese garden is more or less naturalistic, and, as it is modelled on the Japanese landscape, it is of course irregular. It is in every sense ideal, each detail of embellishment being drawn from the best examples of its kind. Not being a flower garden, it seldom contains a flower bed. Some gardens have scarcely a suggestion of the green sprig, and at rare intervals consist of nothing but rocks, pebbles and sand.

It is their mission to suggest certain phases of natural conditions, such as wildness, peacefulness and the like, and to this end is their character restricted. If we compare Japanese landscape art with the original, we will readily see through what eyes the Japanese gardener sees his work. He is limited by certain religious conventionalities and recognised ideals in pine tree, mountain, lake, stone and other shapes. Some tree and stone combinations are considered as fortunate, and are naturally striven for, while the unfortunate form is as naturally avoided. Everything in a Japanese garden means something to its designer and the native. It is an art of symbols and religious suggestions, from its lanterns, bridges, hills, streams, lakes, trees and stones to the specified relation they all bear to one another.

The size of the Japanese garden is one of wide range; it may be of considerable acreage or very small in size. In the latter case the scale of its details is reduced according to its diminutiveness. There are several styles of this branch of art, a description of which is rather too lengthy to be considered here.

Bit of garden at Newburgh, N. Y., showing Japanese influence

From the foregoing brief descriptions it is readily seen that in all cases of foreign gardens, with perhaps the exception of the English type, they are of little value if taken literally. We have in the first place to consider our modes of living in various parts of the country and contrast them with foreign conditions. We must also remember that every garden, be it ever so formal, is more or less an index of the character of the local landscape, and that to attempt an Italian garden in Maine would be exceedingly risky. The Italian garden requires the cypress, the English garden the elm, the Spanish garden tropical suggestions of foliage, and the Japanese garden the pine. In the Italian type our cedar may well replace the cypress, but it should be remembered that it is not only necessary that these botanical characteristics should be embodied in the garden itself but that they should be characteristic of the local landscape as well. Few of the American gardens have observed this fact; they are usually in direct antagonism to natural conditions, and suffer accordingly.

With the extent of latitude and longitude which this country embraces, it is not likely that the American garden is destined to become as distinct a type as those of other countries. Its varying conditions are such as make the adoption of certain cut-and-dried principles impossible. It has demonstrated one thing, however—that, whatever else may vary, the American garden is distinctly a flower garden. This is well, as it gives us the variety attending various schemes of planting without great expense; thus one season is not necessarily the duplicate of its predecessor.

It is well that we consider the foreign garden and its conditions, but let this consideration be thorough, extending even to the reason of things. When we have done this we may draw upon our knowledge and produce for ourselves something that may suggest, but shall be for the time nameless; a creation of simple beauty unfettered by excessive plunder of the Continent; a creation that will be the natural outgrowth of existing conditions and will harmonise not only with the architectural structure but the life and temperament of its owner.

Rock garden, "Yaddo." The brook, bordered by Japanese iris, connects two fountains

An interesting and wholesome rendering of the Colonial. Joy Wheeler Dow, architect

CHAPTER XVI

Contract and Specifications

IN THE preparation of the contract and specifications one must observe two things: First, that all points be fully covered; second, that they be simple and have no double meaning. Thus polite language and figures of speech are not for these. One should decide on what one wishes and put it so there may be no mistake as to its true meaning and intent. As these documents may be called upon to stand in court it is doubly advisable that this be so. The contract in particular is a legal document, from the performance of which there should be no escape for the contractor who is disposed to take advantage in any way. At the same time it should be fair to all parties concerned.

In letting the contract it is not always advantageous that it be to the lowest bidder; more often quite the contrary. The cheap contractor will bid low with the idea of making up for it later; therefore his reputation should be looked into before he be allowed the contract. The trouble and worry with this sort of swindler is more costly than is the awarding of the job to a decent man at a fair price in the first place. As is usually the case in calling for estimates, "the owner reserves the right to reject any and all bids." This allows him a chance to escape from a lot of building sharks and call for new bids.

The form of contract here appended is substantially that drawn up for, and used by, the State of Massachusetts in the construction of the Woman's Prison at Sherborn, in 1875. This contract was approved by Attorney General Train and

has been used with success on this and other occasions, in one of which the contractor tried to break it and could not. In its original form it was so strong that the parties who signed it were practically at the mercy of the State, but as the Commonwealth was disposed to act fairly no objections were raised. The conditions governing the contract for private work make it imperative that its form should be slightly modified, that it may be fairer to the contractor. With this in view, it has been slightly changed and brought up to date, although its original intentions are retained.

FORM OF CONTRACT

These Articles of Agreement, made and entered into at New York City, State of New York, on the thirteenth day of June in the year nineteen hundred and five, by and between Henry Hanghammer, Esq., of Hilltown, New York, party of the first part (also termed the Owner), and Edward T. Burdenton, of New York City, New York, party of the second part (also termed the Contractor), *Witness* that the said parties covenant and agree to and with each other as follows, namely:

First. The Contractor hereby covenants and agrees with the said Owner that he will furnish and provide all materials of every sort, and do and perform all work and labour of every kind, required in the erection and completion of a dwelling house to be located on land of the Owner on the northwest corner of Pine and High Streets at Hilltown, New York, with all the works and appurtenances thereto belonging and therewith connected, as described, specified, and illustrated by the general plans, detailed drawings, and specifications prepared and furnished by J. C. Buster, Architect, of New York City; which said plans and drawings, together with said specifications, being identified by the signatures of the two parties herein mentioned, are hereby made a part of this contract.

Second. The Contractor further agrees with the said Owner, that he will forthwith commence the erection of said building, and prosecute the same without unreasonable delay or intermission, and fully complete and finish the same according to this contract, and deliver up the same completed, finished and thoroughly cleaned of all rubbish, with the keys thereof to the Owner, or other due authorised agents, heirs or executors of the Owner, on or before the fifteenth day of February in the year nineteen hundred and six.

Third. The said Owner covenants and agrees, that if the Contractor shall well and faithfully perform and fulfil this contract, and keep every covenant on his part herein contained, the said Owner will pay to the said Contractor the sum of seventeen thousand one hundred and fifty dollars therefor, in instalments as the work progresses, as follows: Monthly payments shall be made of sums to equal eighty-five per cent. of the value of all material applied to and fixed in the construction of the building and works, the said value to be estimated and determined by the Architect, and paid only upon his certificate, in writing, to the Owner, said payments to be due upon the issuing of said certificates. Provided that the last payment shall not be made until thirty days shall have elapsed after the certificate of the Architect that such last payment is due has been rendered to the Owner; and it is further provided that the said residue reserved for the final payment shall not be paid unless the Architect shall certify that this contract has been fully performed, and that all the damages or allowances, if any there should be, have been adjusted and deducted from said residue, nor unless the Contractor shall accept the same in full satisfaction and discharge all his claims and demands whatsoever, under or in connection with this contract.

Fourth. It is mutually covenanted and agreed, that in case the Owner shall at any time, during the progress of the said work, request any alterations, deviations, additions, or omissions, in, to, or upon the said work, or any detail thereof, as shown in and required by the said drawings and specifications, the Contractor will make each and every alteration, deviation, addition, or omission so requested, and the same shall not in any way avoid or impair this contract, but the cost or expense thereof at a fair and reasonable valuation, to be immediately agreed upon by the Architect, the Owner and the Contractor, and certified at the same time in writing by the said

Architect, shall be as may be just and proper added to or deducted from the payments to be made to the Contractor under this contract, and shall be accounted for and settled by and between the respective Owner and Contractor; the making of any such alteration, deviation, addition, or omission shall not vary the time above limited to the performance of this contract, unless the number of days to be added to or deducted therefrom by reason thereof shall be determined and certified to in writing at the time by the Architect.

Fifth. It is agreed by the parties hereto, that in case the Contractor shall at any time refuse or neglect to supply a sufficiency of skilled workmen and materials of the proper quality, or shall fail in any respect to prosecute the work required by this contract with promptness and diligence, or shall omit to fulfil any provision therein contained, such refusal or neglect being certified to by the Architect in writing, the Owner may, after three days' written notice to the Contractor, provide such requisite labour or materials, necessary to the proper performance of the work under this contract, and may deduct the cost thereof from such payments as are due or may thereafter become due to the Contractor under this contract; and if the Contractor shall be adjudged to be bankrupt or if the Architect shall certify that such aforesaid refusal or neglect be sufficient grounds for such actions, the Owner shall have the right and power to enter upon and take charge of the said work, and expel the Contractor and his servants and agents therefrom and to procure and employ other persons to perform and furnish the work and materials required by this contract, so as to fully execute the same in every respect; and the Contractor shall be liable to pay the said Owner all damages which he may sustain by reason of the failure of the Contractor to fulfil his part of the contract, and shall have no claim or demand to any unpaid balance unless such balance exceeds the amount of damages due the Owner as above stated. It is further agreed that such unpaid balance due the Contractor under the above conditions of refusal or neglect shall be withheld until the said work shall be wholly completed according to this contract, and if the amount of damages due the Owner exceed the amount of unpaid balance due the Contractor, the said Contractor shall be liable for the difference and shall pay the same to the Owner. The expense incurred by the Owner from such above refusal or neglect, either in the furnishing of the proper labour and material, or any damage sustained through the above default, shall be audited and certified to by the Architect, and the text of such certificate shall be binding upon the parties herein mentioned.

Sixth. It is mutually agreed by the parties herein mentioned, that should the Contractor be hindered or delayed in the prosecution or final completion of the said work herein mentioned, by the fault or neglect of the Owner, of the Architect, or any other Contractor employed by the Owner upon said work, or by any delay due to any damage caused by fire or by any other casualty for which the Contractor is in no way responsible, or by strikes, general or local, or by lockouts caused by acts of the employees of the said Contractor, then the time limit herein fixed for the completion of said work shall be extended for a period equal to the time lost through reason of any or all of the causes aforesaid, such period of extension to be determined and fixed by the Architect; it is understood, however, that such allowance shall not be made unless claim therefor, in writing, be presented within a period of forty-eight hours of the occurrence of said delay. It is further agreed that the Contractor is to give the Owner two weeks' notice prior to the time when it is necessary that such material as the Owner is to furnish at his own expense, or the material and labour under any separate contract, should be on the ground for the full and complete prosecution of the work without delay to the Contractor; and in the event of failure on the part of the owner to produce such material or labour and material under any separate contract, the Owner will reimburse the Contractor for such loss of time and expense therein occasioned by said failure. Provided, however, that such failure on the part of the Owner be not by reason of strikes, shortage of market, or from such other causes as shall be adjudged sufficient by an arbitrative board. Should the Owner and Contractor fail to agree as to the fair valuation for loss or damage occasioned by either, one to the other, or of any alteration, deviation, addition, or omission, from the work as shown by the original drawings and specifications hereto appended, and said valuation shall be determined by an arbitrative board composed of one person selected by the Owner, and one person selected by the Contractor, and a third to be selected by the two members already chosen. The decision of the majority of this board shall be deemed final and binding on both parties hereto, and the expense of such proceeding shall be borne by both parties, in equal part.

Seventh. The Contractor shall provide safe and proper facilities at all times for the inspection of the work by the Architect, the Owner, or their authorised agents; and it is also agreed that the Architect may condemn and reject any of the work performed or materials furnished under this contract, and the Contractor shall within twenty-four hours from the receipt of a written order from the Architect to such effect take down and remove from the premises at his own expense such objectionable work and materials as may be deemed by the Architect to be a violation of, or in any way below the standard required by, this contract and the appended drawings and specifications; and should the Contractor fail to cause the removal and proper substitution of work and material as above stated, the Architect may cause the same to be done at the expense of the Contractor. It is further provided that all damage done to other labour and materials caused by the removal of said objectionable labour and materials shall be made good by the Contractor at his own expense.

Eighth. It is understood and agreed by and between the parties herein mentioned that all of the work herein included in this contract is to be done under the personal supervision and direction of the Architect or his authorised agents, or by such person or persons as the Owner, in the event of the retirement of the Architect or his agents, may appoint for the purpose. It is also understood that the decision rendered by the Architect, his authorised agents or such person or persons herein appointed as substitutes, as to the true construction and meaning of the drawings and specifications, is to be considered final and binding upon the parties hereto. It is further agreed that the drawings furnished by the Architect for the construction and completion of the work under this contract shall be full and complete to the proper illustration of the work to be done, and that the same drawings and specifications are to remain the property of the said Architect and are to be returned to him at the completion of said work, both of which said drawings and specifications herein mentioned, together with the Architect's services as supervisor, are to be paid for by the Owner. The Architect is to furnish one set of scale drawings and specifications, to be kept continually on the work convenient for examination by the Architect and Owner or their authorised agents; and the Contractor shall provide a convenient place for disposal of said drawings and specifications, which are not to be used by him or his employees in any other way than for handy reference, nor shall they be removed from the premises, but are to be retained for the purposes hereinabove mentioned.

Ninth. Should at any time there be evidence of a lien or claim upon said work, for which the Owner may, if such lien or claim be established, become liable, and which liability is chargeable to the Contractor, the Owner shall have the right to withhold from any payment then due, or any payment or payments hereafter becoming due, a sufficient amount to completely cover such lien or claim and should any such claim be established after all payments are made, the Contractor shall refund to the Owner such amount as the latter may be compelled to pay in discharging such lien or claim as is by the default of the Contractor made obligatory.

Tenth. The Owner shall maintain a proper and sufficient insurance upon the work herein mentioned as it progresses, against loss or damage by fire, in such insurance company as may be approved of by the Contractor, and the policies made payable to the parties hereto, relatively as their interests in the work; the said policies to cover at all times such work as may be incorporated in the building, and all materials to be used in construction of the same in or about the premises.

Eleventh. It is agreed between the Owner and the Contractor that the latter shall not assign or transfer his interest in the whole or part of this contract, or any right he may have under the same, unless the written consent thereto of the Owner is first procured.

Twelfth. It is further agreed that no certificate given or payment made under this contract shall operate as, or be held to be, an admission on the part of the Owner that this contract or any part thereof has been complied with, or that any detail of the work has been properly performed, so as to affect any claims of the Owner for damages should the work and material hereby required not be performed and furnished in every particular in a substantial and workmanlike manner, and of good and proper quality, or should this contract not be faithfully executed in every respect. It is further provided that no occupation of the building for the purposes for which it was designed shall be deemed to be an acceptance under the terms of this contract.

In witness thereof, the said parties of their own free will, for themselves, their heirs, successors, executors, administrators, and assigns, do hereby, with the full understanding of all and every part of the above contract, agree to the full and complete performance of the covenants contained herein, and hereunto set their hands and seals, on the day and year first above written.

HENRY HANGHAMMER, *Owner*.

Attest: ASA V. DAVIE. EDWARD T. BURDENTON, *Contractor*.

The following specifications are from a practical set used in actual construction. They do not cover all possible conditions, which would be impossible in one form, but they give a good idea of the spirit of the thing, and as it has been the purpose of the foregoing chapters to give some practical hints and suggestions, it should not be a very difficult task to embody what one wishes on these lines. The principal thing is to state that So-and-So shall provide certain materials of a certain quality and shall use them in the best manner to construct some detail in a certain way or form. If there are several contractors working under separate contracts, care should be taken that the cases where their work overlaps should be spoken of in both contracts. For instance: The carpenter is required to furnish and set the wooden supports on which the plumber lays his water pipes. Each contractor furnishes his own staging unless it be otherwise specified.

The heating and plumbing specifications would probably be more than the average amateur would care to tackle. It requires a knowledge outside of books to do this understandingly, and for the average man it would be hardly worth while. He might get an idea of what is right from the book, but to nail it down so that there be no squirming out of its true intention is the work of the expert. Oftentimes the heating and plumbing are given to reliable parties without any formal contract; they furnish the specifications, which are readily explained. It is really the architect's job to make the specifications from data furnished him by the owner.

We have, however, included the plumbing specifications, as they are of such nature that they can be figured on by any plumber. With the heating it is different. Each firm handles its own exclusive style of heater and other details, and often does the job in a somewhat different way than does its competitor. Each is supposed to produce the same results on similar lines in its own way from its own specifications.

SPECIFICATIONS FOR DWELLING HOUSE

FOR HENRY HANGHAMMER, ESQ., OF HILLTOWN, N. Y.

J. C. BUSTER, ARCHITECT, N. Y.

Specification of the Labour and Materials to be furnished in the erection of a frame dwelling house for Henry Hanghammer, Esq., of Hilltown, N. Y., in accordance with the accompanying drawings and their specifications, prepared by J. C. Buster, Architect, New York, also under his supervision.

General Conditions. The Contractor shall furnish all materials, labour, transportation, scaffolding, utensils, etc., of every description, required for the full performance of the work herein specified, except as otherwise particularly mentioned. He shall lay out his work and be responsible for its correctness, shall keep a competent foreman on the premises, shall not sublet any part of his work without the written consent of the Owner, shall obtain all necessary permits to properly carry out his work, paying the lawful fees therefor; shall give to the proper authorities all requisite notices relating to the work in his charge, shall afford the Architect or his agent every facility for inspection, shall be responsible for all violations of law or damage to property caused by him or his employees, and shall properly protect his work during progress.

All the materials are to be the best of their several kinds, unless otherwise particularly specified; all labour to be performed in the best manner by skilled workmen, and both to be subject to the approval of the Architect.

All work and material must conform to the laws, rules and regulations in force in the locality in which the building is to stand, anything herein specified to the contrary notwithstanding. The drawings referred to in this specification will be supplemented by detailed drawings to be furnished as the work progresses. All these drawings are intended to co-operate with and form a part of the specifications and the accompanying contract. Where figures are given they are to be followed in preference to measurement by scale.

Anything which is not shown on the drawings, but which is mentioned in the specifications, or vice versa, or anything not expressly set forth in either, but which is reasonably implied, shall be furnished and performed the same as though specially shown and mentioned in both.

Should anything be omitted from the drawings or specifications which is necessary to a clear understanding of the work, or should any error appear either in the various instruments furnished or in the work done by other contractors affecting the work included in this specification, it shall be the duty of the Contractor to notify the Architect. In the event of the Contractor failing to give such notice, he shall make good any damage to or defect in his work caused thereby.

The drawings and specifications furnished for this work are to be considered instruments of service, are to be used for this building only, are the property of the Architect, and must be returned to him immediately on completion of the work set forth therein.

At any time directed by the Architect, the Contractor shall clear out any of his rubbish and surplus material which may constitute an obstruction to the progress of the work, and at completion shall clear out all rubbish and surplus material left by him, shall repair any damage to his work, no matter by whom caused (loss or damage by fire excepted), and leave the premises broom clean and in perfect repair and order so far as his work is concerned.

The Owner reserves the right to accept any or reject all proposals presented.

The Contractor is to have full charge of the building until completion, and will be held responsible for all property that may be injured or stolen while the building is in his care. The Contractor shall provide all necessary guards, rails and night lights.

The Owner is to furnish fuel and the Contractor stoves to heat the building when necessary during progress. Should the Owner allow the heating apparatus to be used for this purpose, the Contractor shall furnish proper attendance for and be responsible for any damage to the same.

The Owner shall insure the building and the material on the premises, covering his own and the Contractor's interests therein against loss or damage by fire, such policies being made payable to the Owner and Contractor as their interests may appear.

The Contractor shall lay out the building from the drawings and under the direction of the Architect and furnish and put in stakes and batter boards as may be necessary.

Contractor shall make application and pay charges for the introduction and use of water to carry out the work.

MASONRY

Excavation. On the site of building and for 8′ additional all around remove the sod and top soil and stack where directed.

Excavate for the cellar, footings, drains, etc., of the dimensions and to the depth as shown on the drawings and required by the grade.

The excavation to be 12″ larger all round than is shown on the cellar plan.

All earth taken from the excavation and not needed for filling in and grading is to be removed from the premises by the Contractor.

Do all blasting required in a proper manner. After blasting, all beds must be chiselled off level.

Grading. Fill in around the cellar walls after the cement is dry, and fill in all drains herein specified.

All fillings to be well rammed or puddled. Grade neatly away from the building.

Lime, Cement and Sand. All lime for the various works herein mentioned to be "Extra" No. 1 Rockland, freshly burned and thoroughly slacked.

Rosendale cement to be Brooklyn Bridge brand Rosendale Hydraulic cement.

Portland cement to be fresh Atlas Portland cement.

Sand to be clean, sharp, free from loam and salt, properly screened.

Mortar. All mortar for the various works herein specified, except for plastering, to be as follows:

Lime Mortar: One part of lime to three of sand.

Lime-Rosendale Cement Mortar: One part Rosendale cement, one part lime, five parts sand.

Lime-Portland Cement Mortar: One part Portland Cement, two parts lime, four parts sand.

Rosendale Cement Mortar: One part Rosendale cement to two of sand.

Portland Cement Mortar: One part Portland cement to three of sand.

Foundations. Build the foundation walls to the height and thickness shown on plan, of best-quality local ledge stone. To be selected, large-sized stone, laid to the lines on inside, well fitted together, and all voids filled solid with spalls and mortar. Each stone firmly bedded and cushioned in place, and all joints filled with mortar.

All stonework of foundations below grade to be laid in Lime-Portland cement mortar.

The walls from the grade level to the wooden sill are to be in thickness as shown, with local seam-face ledge stone laid up in Lime-Portland cement mortar.

The outside joints are to be raked out and pointed with Portland cement mortar coloured as directed.

Drains. Lay a 5″ vitrified tile drain from a point 10′ outside of the building to the sewer on Main Street.

All earthenware pipes to be smooth, salt glazed and cylindrical, free from defects, each length perfectly straight. The ends of the pipes to be wet before applying the cement, and the space between each hub and the small end of the next section to be completely filled with Portland cement with joints clean inside. Lay with uniform fall and use Y branches for all connections.

Lay a 4″ vitrified tile drain from each leader 10′ out from the building, and run into loose stone drains or pits, 3′ in diameter, 3′ deep, with top 4′ below surface of ground.

Concreting. Level off the cellar bottom, settle thoroughly and put down a concrete bottom 2″ deep of one part Rosendale cement, two parts sand and three parts clean, coarse, sharp gravel, well tamped; cover this with a coat of one part Portland cement to two of sand, ½″ thick; all flushed up smooth with a true and even surface.

Brickwork. Build the chimney as shown on drawings, with flues 8″ x 12″, of brick laid in lime mortar to under side of roof boardings; above roof to be laid in mortar made of clear cement and sand, coloured as directed and all joints neatly struck.

All flues to be carried up separately to the top. Plaster every chimney on the outside to under side of roof boarding. Build in lead flashings to be provided by the carpenter. Provide and set iron thimbles in laundry, each attic room, kitchen and furnace flues, also 8″ x 8″ iron clean-out door and frame in all flues close to basement floor and 12″ x 12″ iron clean-out door and frame in ash pits.

All chimneys, etc., where brickwork is shown on drawings, to be laid up in dimensions as shown, with sound, hard-burned, well-shaped, merchantable common brick. The outside surfaces to be laid up with selected water-struck brick, all laid up in mortar, as above specified.

On completion, the Contractor is to thoroughly clean the outside brickwork, using diluted muriatic acid and water, applied with a scrubbing brush.

Build the fireplaces of rough brick, making the openings 3′ high above the floor, with 2″ x ⅜″ wrought-iron lintel to each opening.

Turn 4″ trimmer arches on centres to all fireplaces.

Build finished fireplaces according to detail drawings, faced with 4″ glazed American tiles, two rows wide, to be secured by polished brass angle bars. Make all hearths of American unglazed red tiles without border and laid in Portland cement, same to be of dimensions shown on detail drawings. Fireplaces to be lined with best Philadelphia glazed brick, as shown. These and all tiles to be selected by the Owner. Provide and set ash grates to all first-story fireplaces.

Terra Cotta. All flues lined with terra-cotta flue lining.

Steel and Iron. Furnish and set "Lally" columns 4″ in diameter with caps and bases, where shown on basement plan.

Lathing and Plastering. The side walls of the cellar are not to be lathed and plastered. All other walls, ceilings, including cellar ceiling, partitions and work that is furred off throughout the building, are to be lathed with sound and dry spruce laths put on ⅜″ apart, with four nailings to each lath, and joints broken every third course on ceilings and every sixth course on walls; no lath to be put on vertically nor to run from one room to another.

Plaster all work which is lathed with a first coat of mortar composed of one barrel of pure lime, thoroughly slacked and strained, to three barrels of clean, sharp sand, free from loam and salt, adding one and one-half bushels of goat hair, well beaten, soaked and thoroughly mixed in. Stack the mortar outside of house five days before using. This coat is to be thoroughly dry before the finishing coat is applied. All ceilings are to be made perfectly level, all walls true, straight and plumb, and all angles sharp and true. The brown coat to be carried back of all trim, base, wainscoting, etc., to floor. Finish with a coat of sand finish composed of one part white-lime putty to three parts of white sand well floated. Cellar ceiling to have but one coat.

Do all patching of plaster work required after other mechanics have finished, repairing all cracks and broken places, and leave the plastering in a first-class condition.

Wainscot the two bathrooms and toilet room on second floor 4′ high with moulded cap and base of Keen's Cement as follows:

First coat: Gauge one bag cement to two pails lime putty, ten pails sand. Use plenty of hair. Thoroughly scratch and let dry before applying next coat.

Second coat: Gauge one bag cement to two pails putty and fifteen pails sand.

Finish coat: Gauge one bag cement and one pail lime putty.

First run base and cap mouldings; then finish space between same as ordinary plastering, using proportions as above.

Whitewashing. Whitewash all stonework visible in the cellar with two good coats, using Rockland lime and plaster of Paris.

CARPENTRY

Timber. All timber, except where otherwise particularly shown or specified, to be of spruce. All to be sound, well seasoned, and free from imperfections impairing its durability or strength, and is to be set with the crowning edge up. All timber to be of the sizes shown on the framing plans.

Framing. The building is to be framed, braced and pinned in the best and strongest manner, perfectly true and plumb, and in accordance with the framing drawings. All framing must be kept 2″ from the outside of the chimneys, and in no case will the timbers be allowed to rest on the chimneys. The sills are to be halved and pinned with hardwood pins. The girts are to be mortised and tenoned into the posts and pinned with hardwood pins. Window and door studs to be mortised to sills and girts. Common studs to be spiked. First-floor beams to be notched and mortised to sills. Second and third floor beams to be sized and nailed to girts and partition caps, spiking the beams strongly together wherever possible to form a tie across the building.

Bridge all floor beams with one row 1″ x 3″ cross-bridging as shown, properly cut in and nailed at each end with two 8d. nails.

Set the partitions as shown on the plans with 2″ x 4″ spruce studs, set 16″ on centres, straight and plumb. Partitions directly over walls, girders or partition plates below are to be run

down to them and are not to rest on the floors. All others are to have soles, and all partitions are to have heads 3″ x 4″, unless otherwise shown. Truss over all openings exceeding 3′ in span. Form all corners and angles solid by spiking two studs together.

Line the sliding-door pockets with ⅝″ x 4½″ tongued and grooved boards.

Bridge all partitions once in their height with 2″ x 4″ pieces cut horizontally and nailed at each end with two 10d. nails.

Boarding. Cover all outside walls with air-dried matched spruce boards ⅞″ thick, free from holes and large knots, surfaced one side to an even thickness and nailed to every bearing with two 8d. nails.

Cover the entire roof with square-edge spruce boarding planed to an even thickness of ⅞″, and nailed to every bearing with two 8d. nails.

Roofing. Cover all roofs with air-dried spruce boards ⅞″ thick, free from holes and large knots, surfaced one side, and well nailed. Cover with two-ply "Neponset" black paper.

The roofs of front and rear piazza, bay windows and bulkhead are to be tinned, and are hereinafter specified under the title of "Metal Work."

Shingle all other roofs with first-quality 16″ sawed Washington red cedar shingles, laid 4½″ to the weather and nailed with two nails to each shingle when under 6″ wide, and three nails when over 6″ wide. Shingles over 8″ wide to be split and no width laid to exceed 8″. Shingles in wide 14 oz. copper flashings, in valleys. The top portions of roofs which are one-third pitch to have "Neponset" paper 12″ wide shingled in with each course.

Form the main gutters of cypress 5″ x 7″ with 2½ lb. lead goosenecks.

Porch and piazza gutter 3″ x 5″, of cypress, with 1½″ lead goosenecks.

Walls. Cover the walls with two thicknesses best-quality two-ply "Neponset" black sheathing paper, with joints well broken, run under all casings and corner boards. Run heavy tarred paper under all casings of doors, windows, etc.

Cover the walls throughout with best-quality spruce clapboards 6″ wide, laid with a 1½″ lap and well nailed to every bearing with 6d. nails set in for puttying.

Outside Finish. Form cornice, base, casings, corner-boards, water table, etc., as shown on drawings and details, of best seasoned white pine, free from sap, shakes and knots.

The carpenter must call upon the painter to prime all exterior finish before putting up or immediately after.

Piazza and Porch. Form porch and piazza columns of cypress, solid, with 2″ bore in centre. Form rails, posts and balusters of cypress. All to be as per detail drawings. Ceil the underside of roof with ⅞″ North Carolina pine sheathing, matched and beaded, not over 3″ wide.

Floors to be ⅞″ x 2½″ rift longleaf Georgia pine, laid with tongued and grooved joints, and outer edges rounded. Cover floor joists, sills and girders with one priming coat of paint.

Fill in with square lattice work between the piers under piazza and porch. The strips to be ½″ x 1¼″ in size, with 1¼″ openings. The frame to be ⅞″ thick, bottom rail 7″ high, and stiles and top rail 4″ wide.

Make bulkhead entrance to cellar, as shown, with 2″ spruce plank steps on 2″ x 12″ spruce plank carriages, 14″ on centres.

Construct the outside steps with 1¼″ treads of hard pine and raisers of ⅞″ cypress. The edges of the treads to have a nosing and cove.

Window and Door Frames. All outside-door frames are to be blocked solid for the hinges and locks. All frames in masonry are to have 2″ jambs, rabbeted, with provision for anchoring the frame to the walls. All outside-door frames to be of best white pine. Front-door frame to be as per detail. Bulkhead, rear and side-door frames to have 2″ jambs, rabbeted.

All outside doors are to have 2″ bevelled and rabbeted thresholds, front door of oak, others Georgia pine.

All casement and stationary sash frames are to have 1½″ rabbeted jambs and 2″ sills of white pine.

The frames in the basement are to be 2″ x 8″ white pine, with rabbeted jambs, with sash hung at the top to swing in with two iron hooks and staples and two iron buttons to each sash, furnished by the Contractor.

All window frames, unless otherwise shown, are to be made for double hanging the sash,

using best bronze chain and $1\frac{3}{4}''$ steel axle pulleys with brass faces. Use lead weights for all plate-glass sash and iron weights for all others. All jambs and heads are to be $\frac{7}{8}''$ thick, and all parting strips $\frac{7}{8}$ x $\frac{1}{2}''$. Both to be of clear Georgia pine primed with oil before being brought to the building. The sills to be $2''$, the casings $\frac{7}{8}''$ x $5''$ with $2''$ moulded back bands and $\frac{5}{8}''$ screen stop, all of white pine.

Sash. All sash, except as otherwise specified, are to be made of strictly clear, well-seasoned white pine, with acorn mould sash bar and weather-lipped meeting rails. All sash are to be rabbeted for the glass, and divided in lights as shown.

All double-hung sash are to be $1\frac{3}{4}''$ thick and to have $1\frac{3}{4}''$ meeting rails.

All single sash to be $1\frac{1}{2}''$ thick.

All sash are to be primed on both sides by the Contractor before being brought to the building. Sash for rooms which are to have a natural finish must be primed inside with oil.

The sash in partition between vestibule and hall to be of quartered oak.

All sash in the living room, dining room, library, reception room, chambers over these rooms, in bathroom over vestibule and front-stair landing are to be glazed in the lower sash with best American polished plate glass. The leaded glass of side lights of front door and vestibule door shall be furnished by the Owner and set in place by the Contractor.

The sash in side entrance to be glazed with silver ripple glass.

All other sash in the building are to be glazed with first-quality double-thick American glass.

Blinds. Provide and hang outside blinds for all windows, except in cellar, dormers, staircases and toilet under each porch, front bathroom and other narrow windows balancing same, made of first-quality white pine, $1\frac{1}{4}''$ thick, with rolling slats in lower half, and cut in folds as required. All are to be marked and a corresponding mark is to be put on the frames.

Furring, Grounds and Beads. Furr all chimney breasts with $2''$ x $4''$ spruce studs set flatwise $2''$ clear of the brickwork, set $16''$ on centres.

Furr the outside walls in laundry and water closet with $2''$ x $4''$ spruce studs set flatwise, $16''$ on centres, straight and plumb, and well nailed to the walls.

Cross-furr the ceilings throughout, except in basement, with $1''$ x $2''$ spruce furring strips, set $16''$ on centres, and nailed to the underside of every floor beam. Furr the outside walls back of all wainscoting for back plastering by nailing $1''$ x $2''$ spruce strips on the sides of the studs.

Furr off for arches, cornices, etc., as shown on drawings or specified elsewhere.

Furr all chamber closet floors to make top of floor flush with top of threshold.

Set grounds for $\frac{3}{4}''$ plastering for all windows and door openings, wainscoting, bases, etc., before the plastering is done, all grounds to be set straight and plumb.

All exposed plaster corners to be protected with metal angle beads approved by the Architect.

Under Flooring. Lay an under floor throughout, except in basement outside of laundry, with $\frac{7}{8}''$ spruce boards, surfaced one side to an even thickness, laid diagonally on the beams and nailed through the top to every bearing with two 8d. nails.

The entire rough floor to be swept clean, repaired, levelled, and covered with one thickness of "Beaver" brand paper before the finished floor is laid.

Cutting and Fitting. The Contractor is to do all cutting required for the other mechanics.

Inside Finish. All the stock for interior finish of every kind to be of the best quality, free from knots or sap, thoroughly seasoned and kiln-dried, and of selected grain where finished natural.

All to be smoothed, scraped and sandpapered by hand before putting up.

All moulded work to be struck in accordance with detail drawings.

The dining room to be finished in mahogany. The first-story front hall and staircase, vestibule, toilet, and library to be finished in clear, kiln-dried quartered white oak.

The kitchen, porch, pantry, butler's pantry, rear hall, the entire third story and basement to be finished in clear kiln-dried North Carolina pine.

All other finish to be clear kiln-dried whitewood.

Door Frames. All inside doors to have $1\frac{3}{4}''$ rabbeted and beaded frames to match finish of rooms.

Where the same finish is used on both sides, they are to be solid, except where oak is used on both sides, where they are to be veneered.

All inside doors, except sliding doors, to have ⅝″ thresholds of Georgia pine, except in rooms finished in oak, where they are to be quartered oak.

Doors. All doors are to be panelled and moulded in accordance with the scale and detail drawings. All wood to be kiln-dried.

All veneered doors are to be on staved-up white-pine centres, with solid mouldings and ⅛″ veneering of kiln-dried wood, well glued on both sides.

Doors which are veneered on one side to correspond with the wood in the room, and which open into such rooms from closets or inferior rooms, must be veneered both sides with the same kind of wood.

The sizes of all doors to be taken from the plans.

The front door to be 2¼″ thick, veneered both sides with strictly clear quartered oak, panelled and moulded, with raised panels.

The rear porch door to be 2″ thick, of solid clear white pine panelled and moulded.

The side door to be 2″ thick, of solid clear white pine with glass in top, as shown.

The outside cellar door to be 1¾″ thick, of solid white pine, panelled and moulded.

The vestibule door to be 1¾″ thick, veneered on both sides with clear quartered oak, panelled and moulded, with large panel at top of best polished American glass.

The doors between vestibule and hall, library and hall, and toilet and hall, are to be 1¾″ thick, veneered on both sides with clear quartered oak.

The doors between dining room and hall to be veneered on dining-room side with mahogany and hall side with quartered oak.

The doors between living room and hall, reception room and hall, hall and rear hall are to be 1¾″ thick, veneered on hall side with quartered oak and whitewood on other, except butler's pantry and rear hall, which are to be North Carolina pine on butler's pantry and rear-hall sides and mahogany on dining-room side and oak on hall side.

The doors between reception room and living room to be 1¾″ thick, of solid whitewood. All doors on second story to be 1½″ thick, of solid whitewood.

All other doors to be 1½″ thick, of solid clear North Carolina pine.

Sheathing. Wainscot the kitchen, pantry, butler's pantry, porch, rear hall and servants' bathroom 3½ feet high, and billiard room 4′ high with ¾″ matched and beaded clear kiln-dried sheathing of North Carolina pine, with moulded cap at the top and base 8″ high with 1¾″ mould on top.

Sheathe the walls, both sides, from floor to ceiling, of laundry, water closet, and on cellar side of cold closet in basement with ¾″ matched and beaded North Carolina pine.

Wainscot the vestibule, front hall and up staircase to chamber door and dining room, 4′ high, with clear, kiln-dried quartered white oak, with moulded raised panels. The rails and stiles are to be ⅞″ thick, with cap and base. All are to be as per detail drawings.

The reception room to have wainscot 2′ 6″ high, of whitewood, with moulded raised panels, with cap and base, all as per details.

Bases. All finished rooms to have bases 8″ high, with 1¾″ mould on top.

Door and Window Trim. All windows and doors throughout are to be provided with trim made of kiln-dried wood in strict accordance with the detail drawings. All wood for natural finish is to be strictly clear. No door or window trim is to be spliced. All interior woodwork is to be finished up perfectly clean, is to be hand-smoothed, scraped and sandpapered, and at completion such work as is to have a natural finish to be properly cleaned and have all stains and finger marks removed.

The trim in vestibule, hall, library, dining room, living room, reception room to be ⅞″ x 5″, with ⅞″ x 2½″ back band, and the doors of said rooms to have moulded caps as per detail.

All other trim to be ⅞″ x 5″ moulded and mitred.

All door casings to have 1⅛″ plinth blocks.

All windows to have ½″ stops and ⅞″ moulded stool and apron.

Door Stops. Provide base knobs with inserted rubber tips behind all swing doors of wood to match finish.

Cornice, Beams, etc. The hall to have wood beams and a moulded wood cornice, as shown by detail drawings, of quartered oak.

Arches, Seats, etc. Construct in hall and stairway, and properly secure in position, the seat, arch and pilasters, as shown on scale and detail drawings. The seats are to be hinged to raise, the risers and back are to be panelled.

Mantels, etc. The Contractor will provide and set all mantels, which are to be built as per details furnished and of the wood indicated on plans.

Closets. Fit up the pantry in clear North Carolina pine.

Provide a counter shelf 2′ wide and 2′ 10″ from the floor. Put up five ⅞″ shelves above, run on the sides on neat cleats, with standards where necessary, from bottom to top, neatly let in and chamfered.

Provide case of three drawers and closets with sheathed doors under the counter shelf. Provide and set in place ⅞″ marble mixing slab, size as shown.

Fit up laundry closet with shelves every 14″ to height of door.

Fit up butler's pantry with a counter shelf 2′ 0″ wide and 2′ 10″ high. Fit up ⅞″ shelves above, 14″ wide.

Enclose the shelves with ⅞″ sash doors glazed with first-quality double-thick American glass, divided in lights as shown on details, arranged to swing. Provide below the counter shelf a case of four drawers, one cupboard for table leaves and cupboards elsewhere.

All to be of North Carolina pine.

All bedroom closets are to have one shelf put up on neat cleats, and strip for hooks under. The library chamber to have case of four drawers.

Fit up linen and blanket closets on second floor with shelves every 12″, with panelled flap swinging down to each shelf.

Fit up linen closet on third floor with shelves, as shown, every 14″ in height to ceiling.

Fit up medicine closet in bathroom over chute, with three drawers at bottom and three shelves above. Enclose with ⅞″ panelled door.

Fit up medicine closets in toilet room over butler's pantry and bathroom over front vestibule, each 2′ wide, 3′ high and 6″ deep, with shelves and panelled doors.

One of the bedrooms on third floor to be fitted with shelves and hooks.

Chute. Construct a clothes chute to run from bathroom to cellar, as shown on drawings. Ceil up vertically with ⅞″ matched North Carolina pine sheathing. Hang proper panelled doors at each floor, of wood to correspond with the wood in the rooms.

Case in all plumbing pipes above the cellar with ⅞″ boards of same material as wood in the rooms.

Lay the floors of kitchen, rear hall, porch, pantry, butler's pantry, laundry, water closet, and entire third story with ⅞″ x 2½″ rift Georgia pine flooring, matched and blind-nailed, well planed and scraped.

Where the lead pipes run under floors they are to run on suitable tack boards put up and graded by the Contractor. The Contractor shall also provide and put up suitable tack boards on the walls and ceilings on which to run all exposed pipes. These tack boards are to be of the same kind of wood as the wood in the rooms, and are to have chamfered edges.

Upper Flooring. Lay the floors of first-story front hall, library, dining room, vestibule, toilet under stairs, two bathrooms and toilet in second floor with ⅞″ x 2½″ quartered white-oak flooring, laid with 12″ border, with all butt ends matched.

All this flooring is to be strictly clear, thoroughly seasoned and kiln-dried, tongued and grooved, blind-nailed to every bearing with 8d. nails, and is to be planed off, scraped and sand-papered at completion and left in a first-class condition for finishing.

All hardwood floors to be laid after all other work is finished.

Lay all other floors throughout with ⅞″ spruce flooring, tongued and grooved, and blind-nailed to every bearing with 8d. nails.

Cut borders around all hearths and registers.

Lay one thickness of "Beaver" brand paper (two-ply) between the upper and under flooring.

Cellar Work. Construct the coal bin with 2″ x 4″ studs set outside. Form the sides with ⅞″ tongued and grooved surface spruce, extending to ceiling. The fronts are to have slides made removable.

Fit up in cold closet two shelves where shown, supported on cleats and standards, all of good quality pine.

Hardware. The Owner will furnish all exposed hardware for front outside door and for living room, dining room, library, reception room, front hall and vestibule and the chambers above them, and all sash fasts and lifts for above rooms. The Contractor will furnish all other hardware, and properly put in place both this and that furnished by the Owner, viz:

All sliding doors to be hung with Wilcox hangers and tracks.

Sash weights of lead and iron, metal sash chains, bronze-finished sash fasts, bronze-finished lifts, 4″ x 4″ loose-joint japanned butts, R. & E. 2¼″ plain bronze-finished knobs, R. & E. 5″ mortise locks with bronzed face and striking piece, front-door lock, R. & E. mortise lever lock with brass face and striking piece, and night latch.

The Owner is to select all the hardware furnished by the Contractor, which is also to be approved by the Architect. The Contractor is to allow the sum of $135 for the above hardware.

Stairs. Construct the front stairs as shown on the scale and detail drawings. Support properly and secure in position. All risers are to be ⅞″ and treads ⅞″, tongued and grooved together, and both housed into the wall strings with wedges glued in. The threads are to have nosing on the edge, with a cove under. The wall strings are to be ⅞″ thick, moulded on top edge to correspond with the adjoining base. The front strings are to be ⅞″ thick, with a moulding on lower edge to cover joint with plaster. The front string is to be carried around well hole.

The rail is to be 3½″ x 4½″ double moulded, bolted together and to all posts, to be of quartered oak. The balusters to be 1¾″ x 1¾″ turned, of quartered oak. The posts to be 4″ x 4″, of quartered oak.

The rear stairs to attic are to have treads and risers tongued and grooved together and housed into the strings in the same manner as main stairs. Treads to have a nosing on the edge with a cove under. The wall strings to be moulded on top to correspond with adjoining base. The treads, risers and platforms are to be of clear Georgia pine.

The posts to be 4″ x 4″, turned, of whitewood.

The rail to be 3½″ x 3½″, double moulded, of whitewood.

The balusters to be 1¾″ x 1¾″, turned and set three to a tread and ⅞″ front strings with a mould on lower edge, both balusters and strings to be whitewood.

Construct the cellar stairs with 1½″ mill-dressed spruce strings and ⅞″ hard-pine treads and risers. Provide a rail of 2″ x 3″ pine with 4″ x 4″ pine post.

METAL WORK

Roofs. Cover the roofs of front and rear piazza, bay windows and bulkhead with N. & G. Taylor Co.'s "M. F." tin in sheets 10″ x 14″ in size, with three nails to each sheet, well soldered.

Paint all tinwork of roofs on the under side with two coats best lead and oil paint.

Valleys. Line the valleys 16″ wide with 14 oz. copper, with end joints locked and soldered and edges nailed to roof with galvanized nails every 12″.

Flashings. Flash as required around all dormers, and masonry coming in connection with the roof with 14 oz. copper 5″ wide, turned up 2½″.

Flash against all masonry coming in connection with the roof with 4 lb. sheet lead worked 2″ into joints of masonry, cemented in with slaters' cement, and brought down to within ½″ of the shingles. Such flashing to be stepped on the rakes.

Flash over all windows and doors with 14 oz. copper.

Put aprons under dormer window sills, nailed to back side of sill and extending 3″ on the roof, of 14 oz. copper.

Leaders. Furnish and put up 3″ galvanized-iron conductors where required or directed on main house, and 2½″ galvanised iron on piazzas where required.

Gas Fitting. The Contractor will tap the main in the street, obtaining the necessary permit, excavating for the same and paying the required charges.

Furnish and put in the gas pipes in accordance with the rules of the Hilltown Gas Light Company, with outlets where marked on drawings.

All branch outlets are to be taken from the top or side of running lines. The whole system

is to be free from taps or low places, and is to decline with a fall toward the meter located in the basement.

All nipples are to project $1\frac{1}{2}''$ from the face of timber. All drops are to be made perfectly plumb by screwing a $12''$ piece of pipe on the nipple and trying with a square or level. All side lights are to be perpendicular to the walls.

All pipes to be best wrought iron, all fittings malleable iron. All put together with red lead, capped, tested and proved perfectly tight before plastering is done.

PAINTING

Painted Work. Putty up all nail holes, cracks or other defects after priming.

Paint all exterior woodwork, unless otherwise specified, three coats of best linseed oil paint, in colours directed.

Paint all metal work three coats of best metal paint.

The hard-pine floors of steps and piazzas to be given two coats of pure linseed oil.

Paint all woodwork in second story throughout, and cement wainscots of the two bathrooms and toilet room on second floor, and outside of all bathtubs, three coats of pure linseed-oil paint in colours as directed, with a coat of white shellac after the first coat. The last coat to contain some varnish.

Natural-Wood Finish. In natural-wood finish care must be taken to have the putty match the finish in colour.

All such work must be cleaned from dirt, finger marks, etc., and all rough spots must be sandpapered. It shall be the duty of the painter to inspect all woodwork and floors which are to be finished, and if such work is not in proper condition for finishing he shall notify the Architect.

The wood finish of the first-story hall, vestibule, toilet, library and dining room to be finished as follows:

First. One coat of best wood filler, with stain in colour as directed, properly and evenly filling the grain of the wood by rubbing in and cleaning off while wet. When dry give:

Second. One thin coat of white shellac rubbed down smooth with No. oo sandpaper.

Third and Fourth. Two coats of Murphy Varnish Co.'s "Transparent Wood Finish, Interior." Rub between these two last coats with haircloth, and rub the last coat with pumice stone and water to a dead, even surface.

Finish the woodwork of kitchen, rear hall, porch, pantry, butler's pantry, laundry, water closet and cold closet as follows:

First. One thin coat of pure linseed oil.

Second and Third. Two coats of best spar varnish.

Finish the woodwork of entire third story with one coat of stain in colour as directed, one coat of wax finish well rubbed in.

The outside front door to be filled with best filler, stained as directed, and given three coats of best exterior varnish, rubbed with pumice stone and oil.

Finish the floor of first-story hall, vestibule, dining room, library and treads of front stairs as follows:

First. One coat of best oil stain in colour as directed, properly and evenly filling the grain of the wood by rubbing in and cleaning off while wet. When dry give one thin coat shellac and follow with two coats of Butcher's wax, well rubbed in and polished.

The hard-pine floors of kitchen, rear hall, porch, pantry, butler's pantry, laundry, water closet and entire third story to be given two coats of pure linseed oil.

The floors of all bathrooms and toilet rooms to be finished as follows: One coat linseed oil and two coats Murphy's floor varnish.

Enamel Finish. Finish the woodwork in reception room and living room with a white-enamel finish, as follows:

One coat of pure white lead and linseed oil, applied carefully so that the brush marks will show as little as possible. One coat of white shellac lightly sandpapered, two coats of white lead tinted to shade required, thinned with half and half oil and turpentine with patent dryer, then brought up with one coat flake-white thinned with opal varnish.

Painted Plaster. Paint the plaster work of walls in kitchen, rear hall, porch, pantry, butler's pantry, as follows:

First. One coat of best lead and oil paint.

Second. One coat of glue sizing.

Third and Fourth. Two coats of best lead and oil paint, with a little varnish in last coat.

PLUMBING

Cutting. The plumber is not to do any cutting of timbers. The carpenter will do all cutting for pipes, etc., and no floor beams are to be cut at a greater distance than 2′ 0″ from bearings.

Piping. The diameters of all pipes, as herein specified, ~~are~~ inside diameters. The arrangement of the waste system is to be as direct as possible, avoiding all unnecessary offsets. The house drain and all horizontal waste pipes must have a fall of at least ¼″ to the foot. All vent pipes are to be graded to discharge the water from condensation.

Cast-Iron Pipe. All cast-iron pipes and fittings must be sound, smooth and cylindrical, free from cracks and defects, of a uniform thickness, and of the grade known as "Extra Heavy."

All vertical runs of cast-iron pipes are to be firmly secured in position with strong iron-pipe hooks placed under each hub, and all horizontal runs by strong iron hangers not more than 5′ 0″ apart.

All cast-iron pipes are to be thoroughly coated inside and outside with asphaltum.

All joints of cast-iron pipes are to be made with picked oakum and pure, soft, moulten pig lead, bedded with hammer and caulking iron, using for each joint 12 ounces of lead to each inch of diameter of the pipe on which the joint is made. No putty or cement joints are to be made.

Brass Pipes. All pipes where brass is hereinafter called for are to be of seamless drawn brass tubing, with brass fittings and screw unions, put together in red lead and firmly secured in position with brass hooks, bands and hangers, put up on suitable blocks where required. All brass pipes where they are exposed to view are to hang on brass hangers.

Testing. Before the fixtures are set the house trap is to be plugged, all openings in waste, soil and drain pipes plugged, and the entire system of waste, soil, vent and drain pipes filled to the top with water in the presence of the Architect or Inspector.

At the completion the water is to be turned on in the presence of the Architect and left for his inspection, after which the water shall be turned off and all traps emptied.

If any defects are found in the work in testing they must be repaired and the tests repeated until the work is found to be perfectly tight.

House Sewers. The Owner will run the house sewer to connect with the house drain. The connection will be made by the plumber. [This gives a chance for the installation of such sewerage system as may be desired. It does not mean that the Owner will do the work in person, but that it will be done under a separate contract, with which the plumber has nothing to do.]

House Drain. Run a 4″ cast-iron house drain from the foot of the soil pipe to a point 5′ 0″ outside of the front of the building, and connect to the house sewer with a tightly cemented joint.

Trap the house drain with a 4″ extra heavy cast-iron running or half S trap, placed just inside the cellar wall, with a hand hole for cleaning, covered with a brass screw cap.

Standing Soils and Wastes. Provide and set lines of 4″ cast-iron pipe and lines of 2″ cast-iron pipe where required, to serve the various fixtures shown on plans or hereinafter specified. Connect each line at the foot of the house drain and continue each line independently 3′ 0″ above the roof, leaving the ends open.

All waste connections into soils and standing wastes and the soil and waste connections into the house drain are to be made with Y branches and ⅛ or $\frac{1}{16}$ bends. All vent connections are to be made with T branches.

Vent Pipes. Provide and run for the line of water closets a 2″ cast-iron vent pipe connected to each water-closet trap, and connected into the soil pipe above the highest fixture.

Ventilate all other traps in the building by running 2″ cast-iron pipes connected to the traps. Run these vent pipes either into the soil or waste lines above the highest fixtures on such lines, or extend them independently 3′ 0″ above the roof.

All joints between the roof and pipes that extend through the roof are to be made water tight

by heavy sheet-lead flashings 18″ square, with a funnel around the pipe. The flashing is to be securely fastened to the roof, and the funnel is to be turned over and caulked into the hub of the iron pipe.

Protect the open ends of all soil, waste and vent pipes above the roof with strong wire baskets properly secured.

Traps. Trap all fixtures in the building, unless otherwise specified, and half S or running traps of the same size and material as the wastes from such fixtures. All traps are to be ventilated as specified and are to have brass trap screws.

Hose Connection. Run a $\frac{3}{4}''$ galvanised-iron pipe to the two front sides of house, with a hose bibb (N. P.) placed at the end of each, and a lever-handled stop and waste shut-off inside the cellar wall. [N. P. means nickel plated.]

Tank. Furnish and set in roof, directly over main stairway, a tank 6′ 0″ x 3′ 0″ and 2′ 0″ high. Line with 14 oz. copper, tinned.

Connect a lead-lined iron overflow pipe 3″ from the top of the tank, and run to the gutter outside with a brass flap valve on end.

Run a $1\frac{1}{2}''$ lead-lined iron pipe from the bottom of the tank to the overflow pipe, with an open-way valve close to tank.

Supply the tank with water through a $1\frac{1}{4}''$ lead-lined iron rising main from the sill under the main stairway. No cold-water branches to fixtures are to be taken from this riser. Place a ball cock on this supply to prevent overflow.

Provide and place at the bottom of the tank a tank valve, with an air tube carried above the water level in the tank, and from it run a $\frac{3}{4}''$ lead-lined iron pipe to supply the boiler and fixtures.

Water Supplies. The Owner will bring the water to the house, where the plumber will make proper connections with the house system. [This gives a chance for the Owner to install such system of water supply as the case may demand.]

Run the necessary branches as required and specified. Place a lever-handled shut-off on the main supply just inside the cellar wall. All supplies are to be graded so they will drain dry. All hot and cold water lines are to be placed at least 1″ apart. No cock is to be placed at the end of a line pipe, but the pipe must extend beyond vertically a sufficient length to form a proper air chamber.

Boiler. Furnish and set complete where shown on drawings one 40-gallon Badger Bros. copper boiler set on galvanised-iron stand.

Supply the boiler through a $\frac{3}{4}''$ brass pipe where exposed in kitchen, with a lever-handled shut-off or valve placed near the boiler.

Connect the boiler with the waterback of the range with $\frac{3}{4}''$ brass pipes and brass couplings. The boiler is to have a sediment pipe and cock.

Supply a $\frac{3}{4}''$ brass safety pipe, to be connected at the top and to extend upward in such course as may be directed to a height above that of the supply tank in the attic. At this point it is to turn down over the tank, so that any discharge may be taken care of.

Kitchen Sinks. Furnish and set complete in kitchen, where shown, one 24″ x 40″ soapstone sink, with 12″ back and soap cup, 5″ brass strainer and coupling.

Supply the sink with hot and cold water. Cold-water supply to be $\frac{3}{4}''$ lead-lined iron pipe; hot-water supply to be $\frac{3}{4}''$ brass. Both to have brass compression cocks. The cold-water cock to have a hose end.

Waste through a $1\frac{1}{2}''$ lead branch waste connected to the soil. Fit with 5″ jug trap with brass trap screw.

Water Closet. Furnish and set in bathroom one F. W. Webb Mfg. Co. "Lucania" water closet, 55-B, with style H seat, chain pull, dark-cherry seat and tank.

Furnish and set complete in basement, where shown, one cast-iron porcelain-lined short hopper, with cistern 18″ x 10″ x 10″ on brackets.

Fit with N. P. chain and hardwood pull and hardwood seat and lid, $1\frac{1}{2}''$ lead flush pipe. Connect closet to soil with a 4″ lead branch.

Wash Trays. Furnish and set in laundry, where shown, a three-part soapstone wash tray, with soap cups. Provide with polished-brass chains and plugs and rubber stoppers.

Supply each part with hot and cold water, cold water through $\frac{3}{4}''$ lead-lined iron pipe and

hot water through $\frac{3}{4}''$ brass pipe. Both to have brass compression cocks. One cold-water faucet to be a hose cock.

Waste through 2″ branch, connected to the soil and trapped with 4″ jug trap.

Bathtubs. Furnish and set complete in bathroom, where shown, one F. W. Webb Mfg. Co.'s 966-B tub, 5′ 0″, fitted with 1048-B cocks and 1024-B waste. Tub to be enamelled white outside.

Trap waste, with 4″ jug trap and nickel-plated trap screw. All pipes exposed to be nickel plated.

Lavatories. Furnish and set complete in bathroom one F. W. Webb Mfg. Co.'s 656-B lavatory.

Furnish and set complete in dressing room of Owner's chamber a duplicate of above.

Furnish and set complete in toilet room off from hall, first floor, one F. W. Webb Mfg. Co.'s 1009-C enameled iron lavatory fitted with Belmont cocks and nickel-plated Brooklin trap.

Pantry Sink. Furnish and set complete in china closet one 16″ x 24″ recessed and encased pantry sink, with nickel-plated standing waste and overflow, fitted with nickel-plated pantry cocks.

In the above form of specifications, the actual brands of materials and fittings and firm name have been retained as given in the original. This is not intended to convey the idea that they are to be preferred to others or that there are not others equally as good and perhaps better.

We make this explanation out of fairness to the manufacturers.

A shingled house, typical in the irregularity of its exterior. Little & Browne, architects

An eighteenth-century Dutch stone house at Hackensack, N. J., showing the typical overhang of the roof. Could be built for about $8,000

A children's playhouse at Cedarhurst, L. I., showing a modern use of the straw-thatched roof. **Cost about $1,000.** Charles Barton Keen, architect

"Wyanhoe," James River, Virginia, showing the homelike simplicity of the small-paned windows of our forefathers

A modern type of American country house, suggestive of the English, built of stone and half-timber. Robert S. Stephenson, architect

The Goddard House at Brookline, Mass. The fan- and side-lights of the doorway are excellent examples of the simple glass work of the Colonial period. The ornamented window caps at the sides add richness to an otherwise plain motive

House at Bronxville, N. Y. Wm. A. Bates, architect. Cost about $7,000

CHAPTER XVII

Practical Hints

THE diverse and scattered hints included in this chapter are such as were not properly a part of any of the foregoing chapters, and yet of enough importance to be included in some form or other. Therefore they have been gathered together under the above heading and arranged in alphabetical order, such being the only systematic arrangement possible.

Balcony. It is often found necessary in balcony construction to give some practical support which shall not make it necessary for the brackets or other supporting motive to carry all or in fact any of the load which they are supposed to. In the balloon frame this may be accomplished, where the inside floor timbers run parallel to the wall from which the balcony springs, by extending the balcony timbers over a ledger board within the building for a certain distance necessary to give the desired support (see Fig. 55). This is really, as will be seen, the cantilever principle, omitting the truss.

"Bed and Build." The bed of a brick or stone is the lower horizontal surface on which it is laid in the wall; the build is its vertical surface or height.

Bridging. Cross bridging is nailed to the top sides of the floor timbers before the floor boarding is secured. This nailing of the flooring to the floor timbers tends to draw up such timbers as are in any way slightly out; any further correction is made by nailing the lower ends of the cross bridging. In this way deficient places may be forced into line through the truss-like agency of the

bridging. This final nailing is not done until just before it becomes necessary to furr and lath the ceiling. By this time every member should have found its bearing.

Straight bridging used between floor timbers should have its grain running horizontally, as do the timbers themselves. Thus the shrinkage of both members may be assumed to be the same.

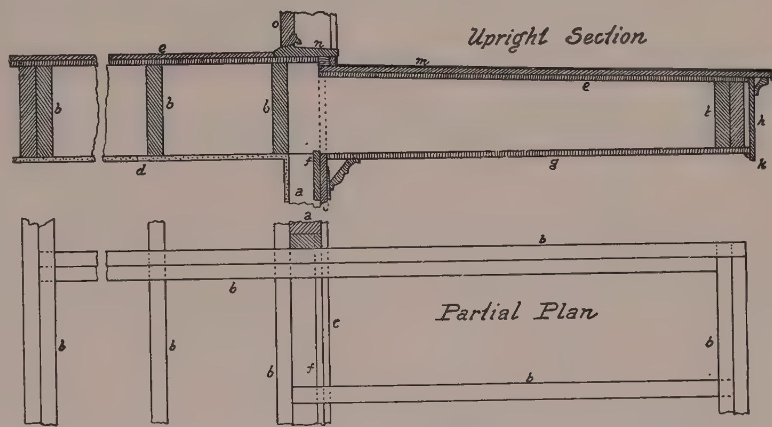


Fig. 55. Section and plan of self-supporting balcony construction

a. Studding
b. Floor timbers
c. Rough boarding
d. Plastering
e. Flooring
f. Ledger board
g. Sheathing
h. Finish board
k. Drip
m. Metal flooring
n. Threshold
o. Door

Bulkhead Door. To avoid the usual drawbacks of the ordinary bulkhead, the door may be stilted on the hatchway by means of a $\frac{7}{8}''$ strip across battens (see Fig. 56). This should be set back 3″ from what would be the hinge edge of the door. The interval between the battens is furred in so as to leave no holes on the side. The head of the door can be protected by a hood, in the manner shown, which will turn back out of the way and fasten by a hook to the house. Of course this calls for the opening of the hood every time the door is to be opened, but the door is so seldom used that this hardly seems an objection. This hood should of course project slightly over the door on either side. Variations of the above suggestion may be made, but it seems to be fairly simple as it is.

Ceilings. Low ceilings may often be given the effect of height by tinting them in some light, retiring colour, as a blue or green. On the same principle, the high ceiling may be reduced by tinting it a rather full shade of red or brown.

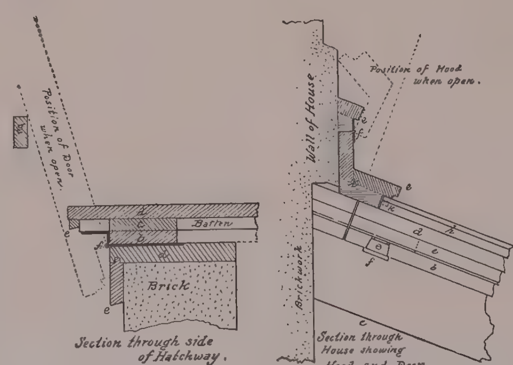


Fig. 56. Sketch showing the weather-tight construction of a bulkhead or hatchway door

a. Matched sheathing
b. Turning-strip
c. Turning-strip to close
d. Hatchway cap
e. Drip
f. Hinge
g. Stop
h. Weather-strip
k. Turning on either side of strip
x. Hood

Cesspool. There are often times when one's neighbour will for some unknown reason build his cesspool over near one's well. With the idea of self-protection, it may be advisable to construct a sort of a wall and drain in attempting to keep this nuisance from permeating your water supply. This wall should be carried as near the cesspool as possible, even on your neighbour's land, if such can be done. It should run for some distance on either side, so as to avoid any leakage getting around

the end of it, and it should be carried as deep as may be practical. This wall consists of a solid wall of stone laid in cement, a wall of puddled clay and a dry wall of small stone containing a porous drain (see Fig. 57.) The dry wall should be of course on the side of the cesspool. It may not be practical to use this in every case, but there are many instances where it may be worth a trial and serve to save the water supply from destruction.

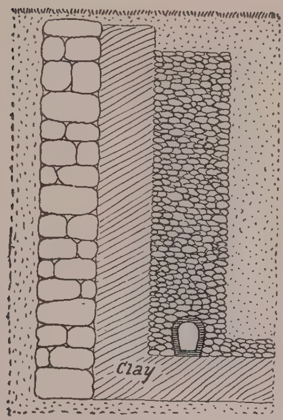


Fig. 57. Section through a protecting wall, and drain

Chimneys. Where chimneys are set in the outer wall of a house and at the lower pitch of the roof they are very apt to smoke badly in cases where the wind comes down over the ridge. This is due to the fact that the wind naturally follows the line of the roof, and consequently goes down the chimney rather than over it. To remedy this defect the chimneys should be carried to a considerable height, and even that may not entirely do away with the trouble. For these reasons it is best that the chimney be located in the inner walls of the house or in some gable end.

Closets, Outside. There are several styles of outside water closets which may be used where heat is not practical to prevent their freezing. The main points in all of these is the protection from the frost of all pipes, traps and valves which hold water, and the quick draining of such pipes as convey water. These closets usually work automatically, by the weight applied to the stool when in use.

About the only form of outside privy or closet is that suggested by Mr. Lawler, and shown in Fig. 58. This type will make a serviceable closet for the summer cottage which does not boast of an inside water closet. The vault is built of masonry, so as to hold water. The soil pipe to the cesspool is trapped where it enters the vault. The water from the roof is carried into this last, and is calculated to keep a certain amount of water in the vault. With the idea that a scarcity of rain may cause the lowering of the water so as to uncover the trap, we have introduced a sliding indicator which is controlled by a float in the vault. When the water falls the float naturally goes with it, and the red field (r) comes into sight in the slot (s). At such time the vault must be filled artificially. The house leaders may connect with this.

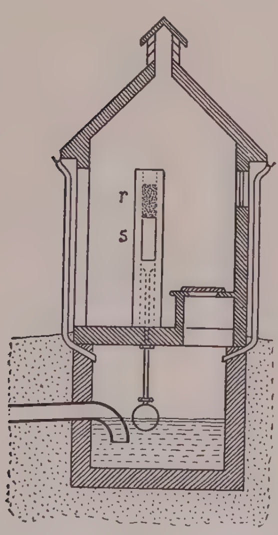


Fig. 58. An outside closet for rural districts

Composting. All refuse capable of fermentation or decay should be composted in the following manner: It should be spread thinly on a dry loam bed in some out-of-the-way spot and covered or mixed with a sprinkling of some light, dry, absorbent substance, as wood ashes, sawdust, dry mould, peat, spent vegetable ashes, marl, crushed straw or dry loam. As one layer becomes dry and hardened a second may be placed on top of it. In this manner the composting bed will accumulate, and be ready at the end of the season for digging into the garden.

It is not best that this bed should be in a hollow so as to hold water; if it be on a slightly convex surface the result is better as moisture retards the action of the air.

Details, Exterior. There is one point that may well be considered in connection with exterior details. Such projecting mouldings and deep carving as may offer a foothold or receptacle for the litter of birds is often annoying in the extreme. In some localities the English sparrow is so abundant as to become a positive nuisance in this respect. We have often seen the Corinthian capital enclosed with an ugly mass of netting to prevent the birds from building their nests in its crevices. It is probably hard to admit that we must limit ourselves to a certain extent in our architectural details, yet many times such considerations would seem to be a wise proceeding.

Disinfectants. A powerful destroyer of animal organism bacteria may be made in a solution of one part carbolic acid to from 40 to 100 parts water. It can be used on garbage, drains, etc., with good results.

Charcoal is an absorbent of foul gases and general impurities. It is said to possess the power not only of absorbing gases but of destroying them when absorbed. Being very porous, its capacity for holding condensed gases is eight times its bulk. It is therefore a valuable agent about the country house, particularly in the cellar.

Driveway. The most practical form of driveway or walk construction is made by excavating a shallow trench, say from 8″ to 12″ deep, and in laying in as an under course a layer of fairly coarse stones. Upon this place a layer of smaller stones, with a finishing layer of crushed stone or gravel. The gutters may be made in the form of a blind drain, and the medium stones used in connection with a porous horseshoe tile (see Fig. 59). The discharge should naturally be cared for.

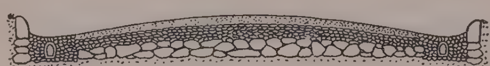


Fig. 59. Section of bed of drive

Echo. It is readily noticed that a bare room will give forth an echo. Sometimes, too, the furnished room may be guilty of the same indiscretion. A remedy that has been tried with success, and which is based on the same principle that governs the correction of the echo by the furnishings of the room, is to introduce projecting motives or loose hangings at the point where the echo seems to exist, which is calculated to rectify this annoying condition.

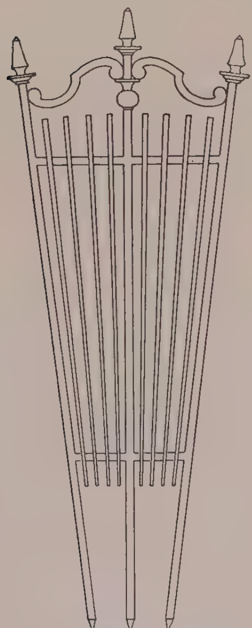
Faucet. The whistling in compression cocks is more apt to be due to vibration than to air. Running water coming in contact with such parts of the faucet as are not absolutely rigid cause a vibration of these parts. Should this be excessive the faucet will probably have to be tightened.

Fire. As a safeguard to protect the roof against fire, a $1\frac{1}{4}''$ pipe may be attached to the ridge and a series of perforations made in each side of it, so that a stream of water turned into it from two or more connections would play at once on each side of the roof. This is an easy and effective method of wetting down the roof in case of flying sparks, and might well be adopted in localities of wooded growth. It is possible to apply the same scheme to the walls of the house itself.

In case the house be not fitted with regular standpipe for fire purposes, it is well to have on each floor, including the attic if possible, one hose bib-cock or faucet, with a coil of hose handy in cases of emergency.

Fowl. We often see pictures of beautiful gardens in which peacocks roam free. Now this is hardly practical, for this fowl and for many others, where choice flowers are to be raised. The birds may do much more damage in a short time than they are really worth as decorative features or otherwise.

Framing. Use care in cutting into framing timbers; too much cutting will tend to weaken the structure more than it will gain in strength by too much framing in.



An inexpensive form of flower trellis, which might be built for $5 or so

Garden. A still body of water, as a pool, may play a very important part in the garden layout, owing to its natural powers of reflection. The house, or some important motive of the garden, may become a hundred-fold more impressive with the introduction of a still body of water between it and the most important point from which it is to be seen.

Garden, Japanese. In the installation of a Japanese garden on a scale smaller than nature, it should be understood at the start that any conflict between this and natural objects of full scale will utterly ruin the scheme. For instance, if your garden is so placed that your neighbour's cow may look over the fence at you while you are contemplating its excellence, the advantages are all with the cow.

Garden, Kitchen. The kitchen garden should be planned with the idea that the rows of planting shall run north and south. In this manner both sides of the row receive the sun some time during the day, provided of course that there are no trees or other obstruction to shade it. It is perhaps well to provide a windbreak of trees to shelter it. This will be found invaluable in the case of corn or like tall and frail growth.

Gutters. Gutters and conductors may be protected to a considerable extent from deposits of leaves and the like by building in under the lower course of shingle a narrow strip of copper screening of about ½″ mesh. This strip should project slightly over the nose of the gutter. Should it be necessary to get at the inside of the gutter this strip of screening may be turned back, the lower being unfastened; in replacing it, it may be necessary to fasten it to the gutter nose with a few small staples in order to keep it in place. In a case where overhanging trees exist this expedient may be of much service.

Hangings. The appearance of coolness and of warmth may be largely influenced by the colour of the hangings. The warm colours naturally suggest warmth and the retiring colours coolness. The red or warm brown or yellow hanging for winter use may do much to influence and carry out the general impression of warmth and glow.

Heat. By the use of excessive artificial heat air becomes artificially dry. To obviate this a vessel containing water should be placed in the room near the source of heat.

Hedges. We often see old spruce and cedar hedges which have become slightly "worm-eaten" or dead in parts so as to be very irregular. Oftentimes these

may be repaired to a certain extent by clipping on the lines of these irregular imperfections, with results both pleasing and in good taste. This scheme has already been carried out with the above results.

Laths. All laths that show knots or stains or portions of bark should be rejected, as such will be sure to stain the plastering. Such stains can never be covered up by any plaster finish, and are even apt to force their way through wall paper.

Lumber. It is often possible, in some rural districts, to build the inexpensive house to a certain extent of second-hand lumber. When this is done one should make sure that the stock is sound and not suffering from dry rot. It should never be used for exposed work nor for the principal sticks in the frame. The carpenter is apt to object to this, and naturally, too, as he may be obliged to saw into more nails than his contract calls for.

Mouldings. On the principle that a piece of wood planed on both sides and later disturbed by the moulding tool, as in the case of the wooden moulded casing, will curl or warp toward the side which has thus been cut away, it is customary to reduce the back of a casing slightly, leaving a slight margin on either edge so as to obviate this. Should the moulding on the face of the casing be deep enough to still occasion a slight warping, this reduction will prevent it from pulling away from the other members and leaving a crack, as the slight depth of the reduction keeps the centre from reaching a bearing on the supporting member and thus throwing out the edges (see Fig. 60).

Fig. 60. Sections of casings

Pictures. In setting the studs in the walls of the principal rooms it is advisable that a heavy stud be placed exactly in the centre of such sides as it may be desirable to hang heavy pictures or mirrors from. In this way the support is absolute. The spacings may be made in any order, as long as they are marked on the plans with their correct locations so that they may not be forgotten.

Pictures should not be hung at too great an angle to the wall, unless it be absolutely necessary to do so in order that they may be properly seen. The lines of an inclined picture frame never harmonize with any other lines in the room, thus the picture that is so used becomes a foreign element which does not belong in the space that it occupies.

Pigeons. Paint the roof of a pole house white, so that it may be easily located by young birds and serve as a guide to the old birds in foggy weather. After the same manner the roofs of dove-cotes and barn vents may be treated.

Pipes. The cross-sectional area of a service pipe should equal the area of probable flow as determined by the various outlets.

Planning. In making preliminary sketch plans it is of great help to use a piece of cross-section paper in which the inch is divided into eighths. Over this a piece of tracing paper which is of rough enough texture to take the pencil can be stretched. Thus we have a scale which will make the free-hand sketch in proportion, and we can tell better in this way whether things are going to fit or not; it is also a saving in time over the use of the ordinary scale.

Plaster. An old way of drying out the rough plastering, and a good one, too, was to delay the placing of the outside wall covering until the plaster had become fairly hard. It can readily be seen that the cracks in the wall boarding effected

a circulation of air, which tended to a more even drying than if the space between studs were sealed tightly. In the case of back plastering this is ineffective.

Porches. It should be remembered that the presence of thick foliage on porches, piazzas and house walls has a tendency to invite moisture, harbour insects, and often shut off light from the house. It should further be remembered that in the case of a wooden structure, where the walls, etc., have to be repainted, these same vines have to be removed in order to execute the work properly. Understanding this, it may be well to consider the advisability of using the natural-wood finish, as this may be retouched with spar varnish or oiled with less trouble, as far as the vines are concerned, than if paint was used.

Power. The power necessary to raise a given amount of water is calculated as follows: Multiply the number of gallons raised per minute by 8.35 (the weight of one gallon of water), and multiply the product by the height in feet to which the water is to be raised; this equals the number of foot pounds. Divide this by 33,000 (one horsepower), and the result is the horsepower required. Allow 15 per cent. for friction.

Pump. It is always best to have a hand force pump connected in the pump house, even if you do use power, so that in case the power should give out your system will not be totally disabled.

Where a pump is to be used by women and children, especially if the total distance which the water is carried be considerable, an easy working pump is an absolute necessity. Therefore the leverage should be long and the bore comparatively small.

Diameter of Pump Bore	Height of Lift	Size of Pipe	Gallons per Minute	Diameter of Pump Bore	Height of Lift	Size of Pipe	Gallons per Minute
2 inches	Ordinary	¾ inches	6	3 inches	Under 18 feet	1½ inches	22
	Under 18 feet	¾ "	8		Over "	1¾ "	22
2¼ "	Over "	1 "	8	3¼ "	Under "	1¾ "	26
	Under "	1 "	12		Over "	2 "	26
2½ "	Over "	1¼ "	12	3½ "	Under "	2 "	30
	Under "	1¼ "	15		Over "	2¼ "	30
2¾ "	Over "	1½ "	15				

Radiators. The pounding often noticed in the pipes of the steam radiator, and commonly called "water hammer," can be prevented by locating the horizontal return pipes in the basement at a level below the water line in the boiler; or, in other words, by putting the return pipe where it belongs.

In an indirect system never allow one coil to supply two outlet registers; always give a separate coil to each room.

Direct radiators, especially those of steam, should, if large, be made in sections, so that but one section may be used if desired. This will be found of much practical value in regulating the supply of heat in mild weather, which feat is most difficult with the radiator of the ordinary single type.

Right-Angled Triangle. In laying out a building without the assistance of a surveyor it is necessary to be able to make the corners of the building absolutely square. A simple method of effecting this is by laying out a correct right-angled triangle, which is done in the following manner (see Fig. 61): Supposing A to

be the corner of the building, measure off from this on the line of the established side 66′, and drive a nail accurately into some sort of wooden stake, which would be point B. Then take two tapes and put the ring of one about the nail at A and the ring of the other about the nail at B and stretch them in the direction of C. By making the distance on the A tape $49\frac{1}{2}'$ and that on the B tape $82\frac{1}{2}'$, the intersection of the tapes at these points will be the true point, C, and the triangle thus formed will be a true right-angled triangle.

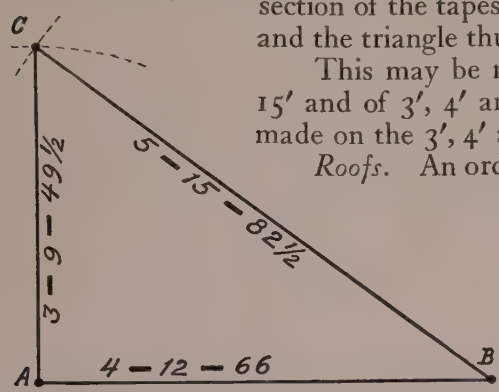


Fig. 61. Showing the laying out of a right-angled triangle

This may be made on the smaller scales of 9′, 12′ and 15′ and of 3′, 4′ and 5′. Carpenters often use wooden squares made on the 3′, 4′ and 5′ sizes.

Roofs. An ordinary roof 20′ x 40′ is 800 square feet. The largest amount of water in gallons that one may expect to collect from it may be roughly determined by multiplying one-half the area in feet by 7.10. Therefore it is possible to get 2,840 gallons from the above roof; 1,480 gallons is, however, about the average quantity.

It is not advisable to make a roof for shingle or slate much flatter in its pitch than 30°. The lower pitches are hardly to be trusted where this covering is used, and such should be covered with metal.

Shaving Bay. For the shaver who has cut himself often, through the poor provisions of the ordinary house, Fig. 62 is offered as a consolation and a balm. It can be varied to suit the taste, but its principle seems good. It is simply a bay about 6′ wide, adjoining the bathroom and having one door into it and another into the hallway. A mirror is affixed to the front side and lighted by windows from the right and left. A shelf is built to connect from one side to the other and is fitted with a washbowl on one side; drawers are placed underneath where desired. This shelf should be about the height of an ordinary washbowl and the window stool should sit upon it. The top of the mirror itself should not be more than 6′ 4″ high, and a light placed at the top and close to it. Another light should be placed about eighteen inches to the left of the mirror (b), so that it can be used at night and receive light from both sides. The razor strop can be hung under the slight projecting shelf in front of mirror (a).

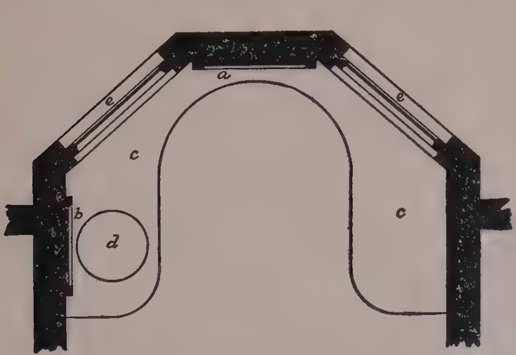


Fig. 62, A bay window arranged especially for convenience in shaving

a. Mirror
b. Mirror
c. Shelf
d. Washbowl
e. Window

This scheme seems practical for both the large and the small house. It can be made a part of the bathroom, in which case the tub could be placed across the inner end and the toilet be made a separate room, as it should be in any case. Each should have a separate entrance.

Shingles. The practical laying of shingles is illustrated in Fig. 63. The lower course is a double course, the under one of which has from 2″ to 3″ sawed off the butts. They are ordinarily laid $4\frac{1}{2}$″ or 5″ to the weather, and no shingle wider than 8″ should be laid without being split. The vertical joints should never be broken for a less distance than 1″; a trifle more is better. The nailings occur on a line slightly below the centre of the shingle from butt to tail and should not be too near the edge, nor should they be exposed in the joint between two shingles. A wider shingle should have three nailings, the narrow ones two.

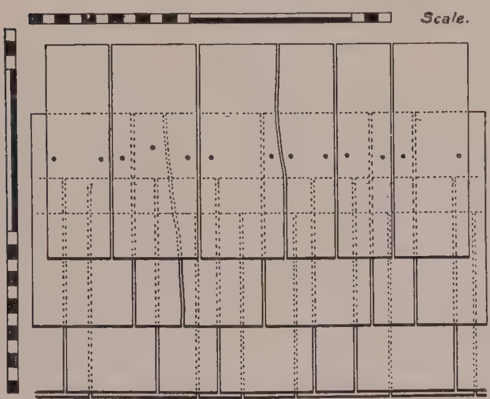


Fig. 63. Showing the laying of roof shingle

Shrinkage. To obviate the possibility of unequal shrinkage of floor timbers, which would tend to a settlement of the inner walls, it is always best that the total depth of floor timber and supporting girder, and depth of floor timber to firm bearing in the underpinning, should be as nearly as may be possible the same. If a 10″ floor timber rests upon the outside brick wall, with the full 10″ from the top of the timber to its solid bearing, and this same timber be supported by a girder, even though it be sized upon this latter member, it is readily seen that the depth of shrinkable wood is greater in the case of the latter bearing, and that consequently the settlement will be much greater at this point. To obviate this the timbers should be framed into the girder so as to bring the supporting pier as near as possible to the height of the brick support of the floor timber in the outer wall.

Sink. The kitchen sink is not intended to carry off anything but water; tea and coffee grounds and other refuse surely do not belong in it. Have a grease trap installed and looked to frequently. Potash or lye can be used, or sal soda and boiling water, to cut away obstructions, oftentimes with success, but this is only when such obstructions are slight. Hot water forced into the pipe through a short piece of hose or special pump may sometimes be used for this purpose.

Much of this difficulty may be obviated by the use of a special flushing device, which is attached to the waste pipe and which holds several gallons of water. When nearly filled with water from the sink it overflows and forms a syphon, which empties it entirely. This intermittent discharge continues automatically.

Site. As an aid to the selection of the site, some of the geographical charts published by the Government may be found of value in locating contours and the like. These may be had from Washington for five cents each, or 100 for $2.

Early in the morning is the best time of the day to determine one very important feature to be considered in the choice of the site. At such times the presence of wet ground may easily be detected, as such localities are overhung with a slight fog or mist. The soil may or may not give outward indications of moisture other than this, but it exists nevertheless. This may also aid in locating water for the well.

Stagings. If one is in anywise particular as to whether his travels over the contractor's stagings are reasonably safe or not, he should watch the building of this structure and assure himself that there be enough nails, and of a size calculated to hold it securely. Some carpenters will pin all their faith to one nail, and often with serious results; another nail or two would cost no more nor take more time in the driving than would the other.

Stones. Stones used in connection with brickwork in the outside face of a wall must naturally be of a depth to equal a certain number of courses of brick. Therefore it is always advisable that this dimension should be marked on the plans as "so many courses." In this way the stone is bound to match the courses of brick, as a contractor is responsible for the correctness of the figures which he gives to the stonecutter. As bricks vary, it is a common practice to lay up a small portion of wall with such kind as may be specified, and thus the required dimensions are easily gotten from this.

Do not use stone that has a marked tendency to decay, crumble, or otherwise deteriorate and thus become useless. Some kinds of sandstone decompose more rapidly than is desirable. Examples of this are seen in the badly weatherbeaten brownstone fronts in New York City. A certain sort of granite, called red granite, a product of the eastern part of Massachusetts and containing a considerable quantity of iron, is in some forms very quickly converted into red gravel.

Timbers. There are often cases where it is better to use timbers made up from two or more smaller timbers than to use one large stick. The reason for this is that any crack or other imperfections occurring in the timber have a tendency to weaken the whole stick, whereas such imperfections in the made-up timber are limited to a single stick, and, as the grain in each stick is different and the sticks fastened securely together, the loss of strength is slight as compared with similar conditions in the single stick.

Traps. Be sure that the traps in your summer house be filled with water just as soon as the house is opened for the season. The traps are very apt to dry out when not in use.

Obstructions in traps are often caused by careless children and servants, who throw anything into the waste that they wish to dispose of. Burnt matches and hair are particularly bad for the trap; they should never be thrown into a water closet even. Therefore look often to the traps; it is hard to tell what they may contain.

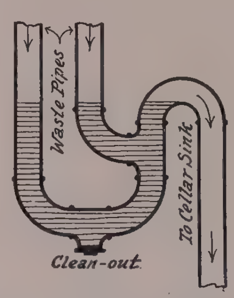


Fig. 64. Suggestions for a made-up trap to connect both tank overflow and ice-chest overflow

Sometimes it may be practical and desirable to connect the waste pipe from the ice chest and the overflow from the attic tank. As it is always best that such pipes should be trapped, owing to the possibility of invasion from insects, this may be effected by using some such made-up form as is shown in Fig. 64. In this manner both pipes are sealed with the same trap, the ice chest furnishing the water.

Trees. In some parts of the country, particularly on the Maine coast, the spruce tree seems to be condemned at a very early age. Other trees in other localities may deteriorate in like manner. It is well, therefore, to know

what to expect of a tree before you rely too much upon it as a feature of your estate. If it is not reasonably sure of lasting it is not worth the trouble.

Trees, Dead. A very picturesque motive may sometimes be made by utilising the roots of a dead tree which it has been necessary to remove. Cut off the trunk at the usual height from the ground, and the roots in a circular form about the trunk; the whole may then be tipped on edge, in the manner of the old stump fence. This, being somewhat trimmed and cleaned, may be used as a staddle for climbing plants with considerable effect.

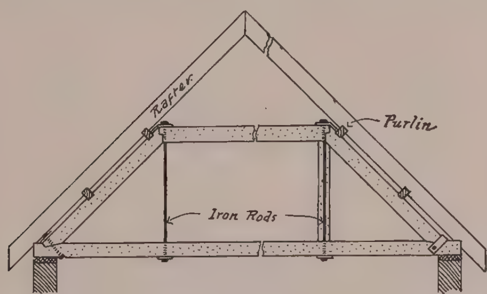


Fig. 65. The application of the queen post truss

Trusses. Trusses for heavy partitions, otherwise unsupported, and for roofs may be constructed in the queen post form, as shown in cut. (Fig. 65.)

Vents. Ceiling vent ducts can often be concealed by means of the cornice, and the vents themselves be pierced registers in one or more of the ornamental panels occurring at intervals in the frieze, or by continuous perforations in the ornamental crown member of the cornice. Sometimes the centrepiece is thus used.

There are cases where the pilaster can be used as a vent duct. The floor vent is then pierced in the ornamental panel of the base, and the ceiling vent in the deep cuttings of the cap. The natural piercings of Byzantine ornament can thus be readily utilised.

Walls. It is noticeable, oftentimes, that a white coating will often come on the outside of a brick wall after it has been laid. This may be removed by an application of dilute muriatic acid and water, applied with a scrubbing brush.

It is not a custom nor is it the right principle to make the first story of an outer wall of brick and the second of stone. These two materials in combination should be used in the reverse. In any combination the material having the effect of greater heaviness should be at the bottom of the wall.

Well. The conditions of the sides and bottom of an open well may be determined, on a bright day, by the use of a mirror; by this means sunlight can be reflected into its darkest corners.

Often when sinking the driven well the pipe is apt to become clogged by the penetration of soil through the perforations in the shoe. To remove this obstruction a series of small pipes are put together in lengths, lowered into the well pipe, and a pump attached to the top. The whole is then lifted slightly, so as to be free of the bottom, and water poured in between the two pipes. Pumping will remove part of the obstruction; a repetition of the process will thoroughly clean the pipe.

Windows. Should a window stick, the best way to start it is in the following manner: Take a piece of $\frac{7}{8}''$ soft pine, about 8″ long and 4″ wide, and pad one end of it with several thicknesses of cloth. Then, with the cloth end against the sash at the point of sticking, pound moderately with a mallet or hammer. It may be necessary to go all around the then engaged side of the sash, but care should be taken to keep the pine stick close to the stop bead or stool, as the case

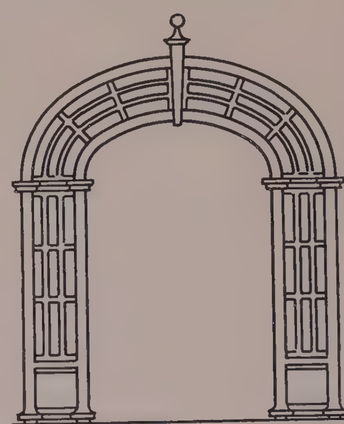
may be, where it will do the most good and be less liable to break the glass. If the above method is not effective it is better to let the sash dry out naturally, and if the sticking be of frequent occurrence to have the sash unshipped and the binding edges reduced slightly with a plane.

There are several stupid ways of putting on the outside or "storm" sash, the worst of which is to carry it up a ladder and screw it on from the outside. If you don't object to falling several stories and wearing the sash for a ruff, try it; it is solid and tight when once in place, be that on the window or the neck. A better and easier way is to get good stout screw eyes of a size which will admit a fair-sized screw through the eye up to the head. In the case of an ordinary sized window three on a side are sufficient. They should be placed in the inner edge of the outside casing, one in the middle and the other two about 4″ or 5″ from the head and window sill respectively. A small but strong ring screw should be placed on the inside edge of the window muntin, near the centre of the window. The ring of the screw should be amply large to allow the finger to pass through it, as it is used to hold the sash in place while it is being hung. Holes should be bored in the sash to correspond to the screw eyes, so that the screws will turn into place easily. The sash is then put through from the inside and the foot brought to a bearing on the window sill; with a finger of the left hand through the screw ring the window is then brought into its proper place. The screws are then readily driven home through the screw eyes, the two middle ones first, thus holding it so that both hands can be used for the placing of the others. It will readily be seen that this method is easy of adjustment by one person, and that the sash is drawn tightly against the casing.

Waste. Do not turn house waste into a blind drain, as the stones are soon choked with grease and other matter which filter into it. A drain pipe should be used for this purpose.

Water. Most water is incapable of corrosive action on lead, owing to its lack of absolute purity. Owing to the abundance of nitrates in well water its action on lead is more active than that of some other sorts of water.

In arranging for the piping of a house the kind used should be determined by the effect that the water has upon it. This test should be made by a competent expert.



End of a simple arbour enclosed with plain slatting on the sides. Made of ordinary height and 15 feet long, it might be built for about $40

To protect the lead pipe from corrosion by the action of water, there are several authorities who suggest the introduction of dilute chemical solution into the pipes to form a protecting lining. One of these uses sulphite of potassium, in a solution of one pound of sulphite to two gallons of water, and allows it to stay in the pipe twelve hours.

A column of water 12″ high exerts a downward pressure of .43 pound to the square inch. To find the pressure in pounds per square inch exerted by a

column of water of any height, multiply the height in feet by .43. To find the head, multiply the pressure in pounds per square inch by 2.31.

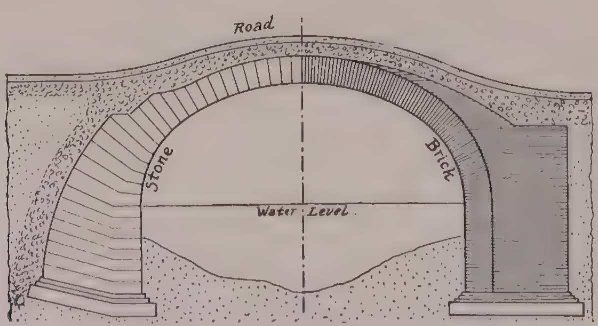
Water Pipes. Often obstructions occur in the service pipe of so slight a nature that they may be easily remedied by the owner. To tell whether the service pipe is leaking or partially clogged, where the water does not flow as freely as it ought, close all the faucets except one and place the thumb over the opening before turning on the water at this point. Take note at the start how much pressure is required to keep the water in the faucet. If the pipe is but partially clogged the pressure will increase as the pipes become full, and frequently the pressure becomes so strong that the thumb cannot hold it. Should there be a leak the pressure will remain practically the same. The presence of small fish may easily be detected by taste or smell.

To clear the obstruction, water should be pumped into the service pipe by means of a strong force pump. If this be not effective, the obstruction is very likely of a soft and slimy nature, and vibration must be employed to loosen it. This is effected by opening and closing some stop cock on a line of the public service very quickly; in the same manner open and shut some other faucet in the cellar. It is essential that the water be fairly started before it is checked. This operation, repeated at short intervals, causes a vibration in the pipe, which tends to loosen the obstruction.

When a leak occurs in the water pipe, *shut off the water at once.* This is easy enough, but everyone in the house should understand this, and how to do it in case of emergency.

The roaring sound from running water in pipes is caused by their being secured to the house frame in such a manner as to vibrate and jar the entire framework, which acts as a sounding board. If a layer of thick felt is laid between the pipes and its support this vibration will be deadened.

Water Tower. A miniature water tower can be made from a length of ordinary hose attached to a long piece of 2″ x 3″ spruce scantling. The nozzle should be turned at right angles to the scantling at its top, and a shut-off may be provided near the bottom. This device can be easily handled, and may be of considerable service in a locality where the fire department is not efficient.



Section of an elliptical arched bridge, showing stone construction on the left side and brick on the right side

Mantel at Kingston, N. Y., designed by Wilson Eyre, architect

With the idea of showing the variation in cost of labour and material in the various parts of the country, the above design has been estimated in several localities on the same basis. It was to be of the accepted wood of the locality, prepared for painting: to be a first-class job, primed one coat and delivered in the city where it was made. The figures, while not entirely conclusive are nevertheless suggestive and interesting:

New York City,	$80	Seattle, Wash.,	$47
Philadelphia,	75	Pomona, Cal.,	26
Chicago,	55	Davenport, Iowa,	39
Boston,	84	Jacksonville, Fla.,	56
Bar Harbor,	50	Anniston, Ga.,	16

A typical Southern Colonial house of the Revolutionary period